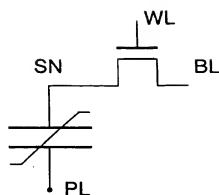
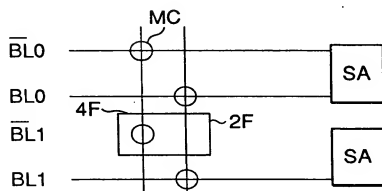


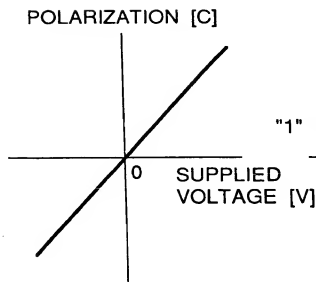
**FIG. 1A**  
 PRIOR ART



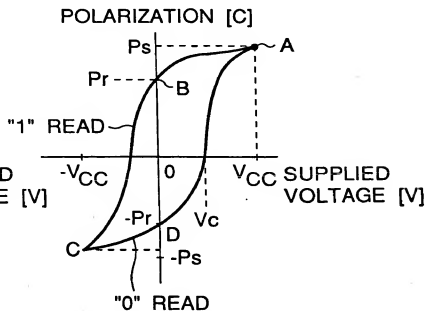
**FIG. 1B**  
 PRIOR ART



**FIG. 1C**  
 PRIOR ART



**FIG. 2A**  
 PRIOR ART



**FIG. 2B**  
 PRIOR ART

FIG. 3A  
PRIOR ART

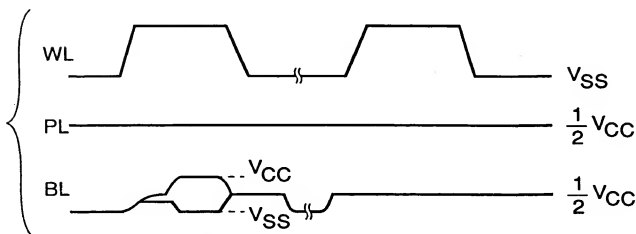
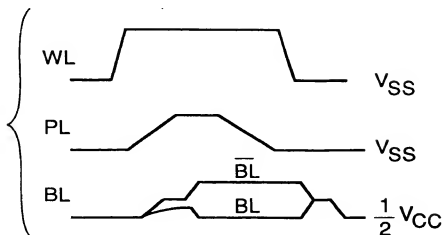


FIG. 3B  
PRIOR ART

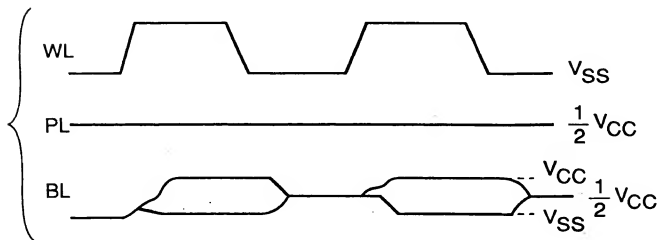


FIG. 3C  
PRIOR ART

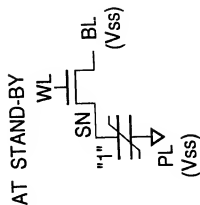


FIG. 4A PRIOR ART

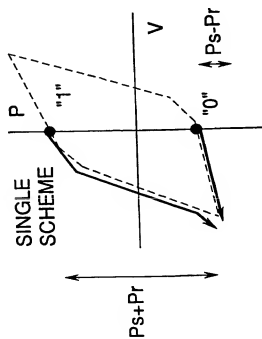
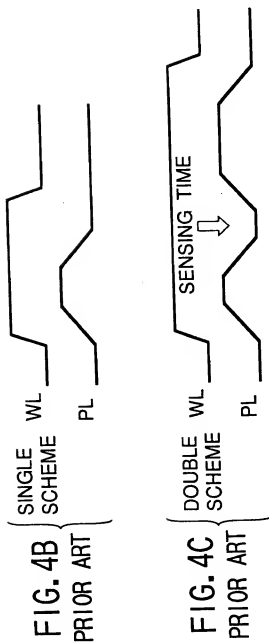


FIG. 4D PRIOR ART

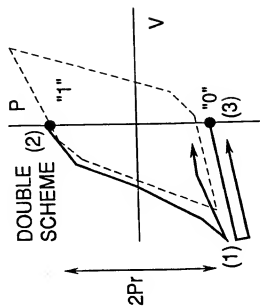


FIG. 4E PRIOR ART

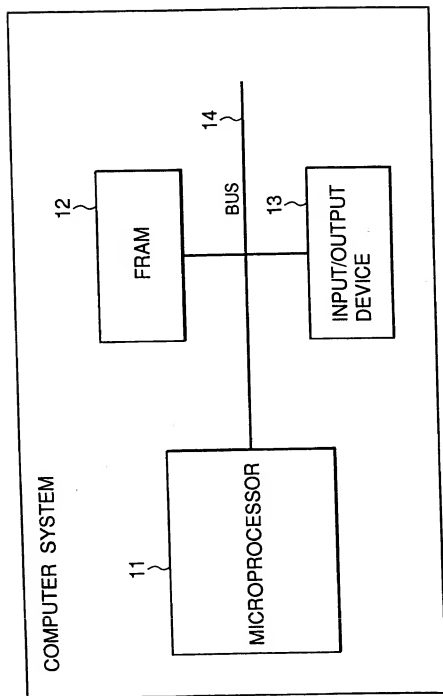


FIG. 5

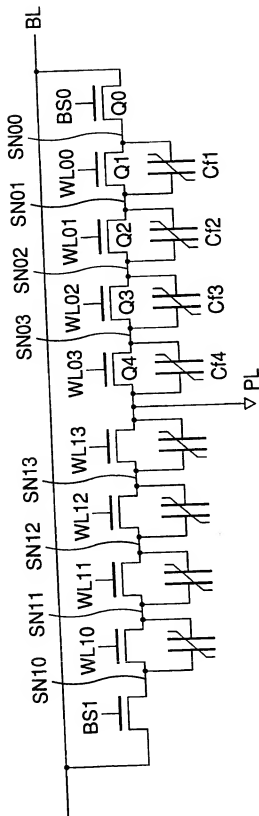


FIG. 6A

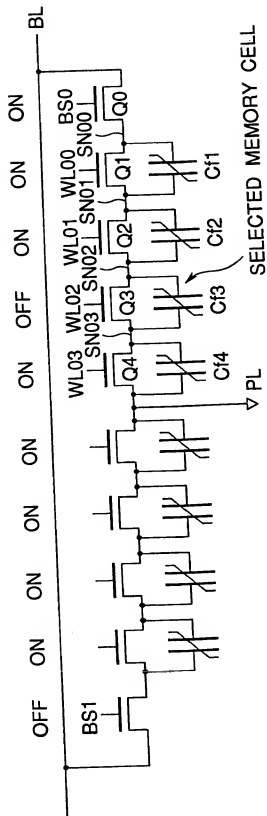


FIG. 6B

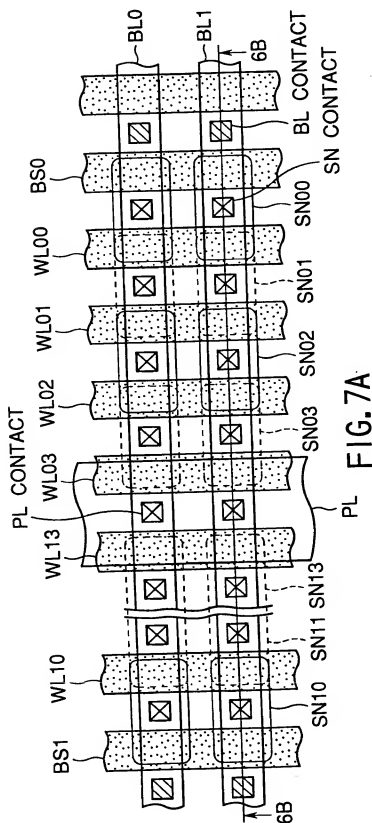


FIG. 7A

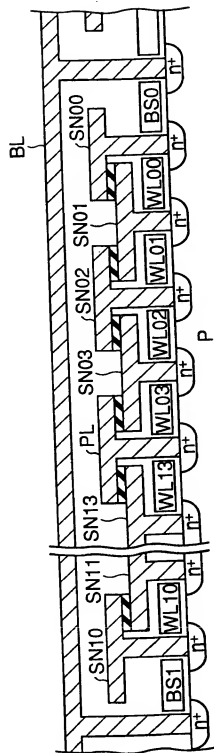


FIG. 7B



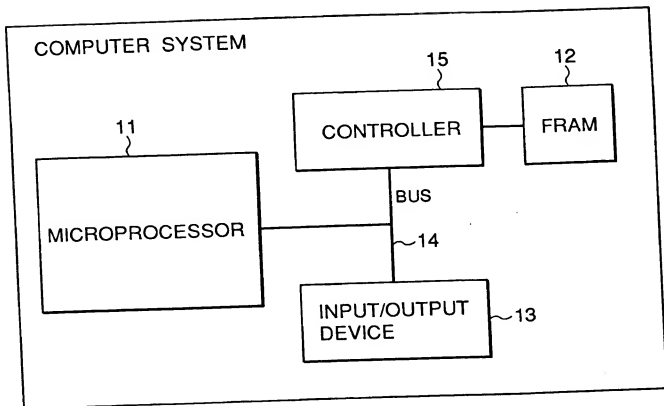


FIG. 9

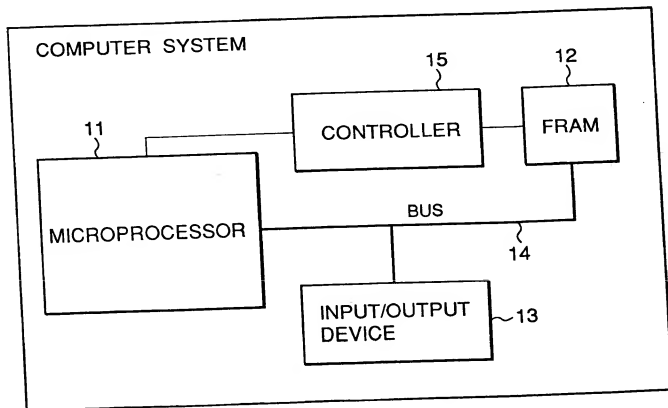


FIG. 10



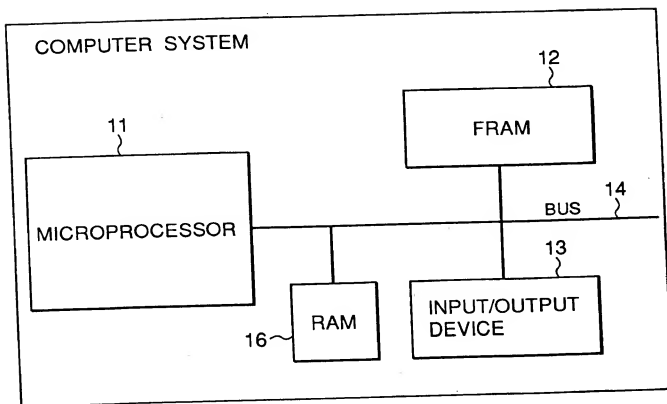


FIG. 11

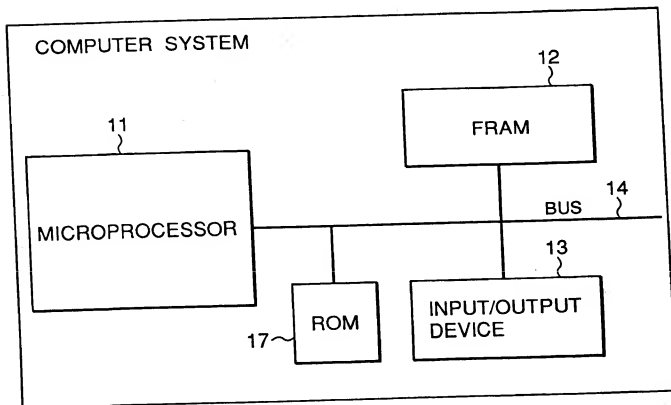


FIG. 12

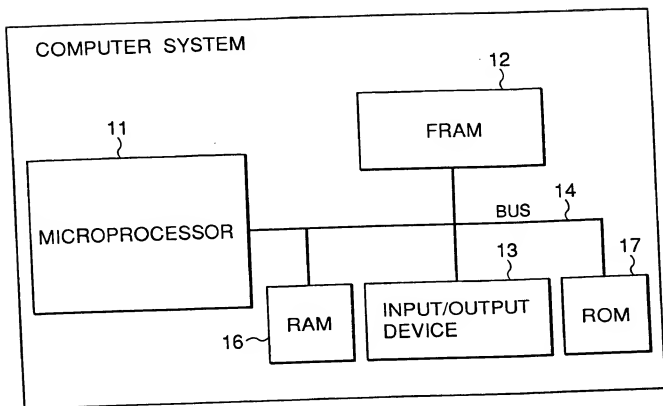


FIG. 13

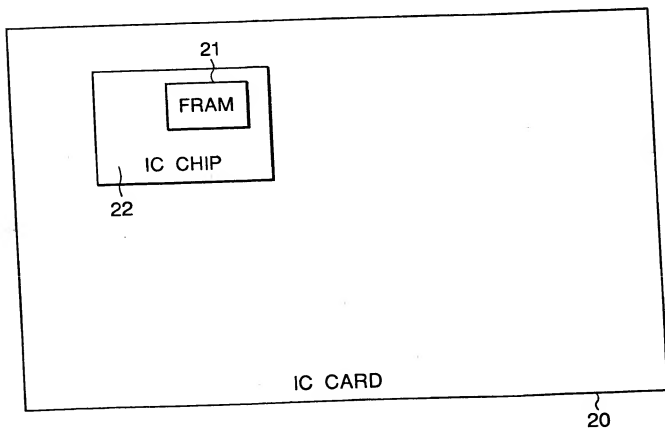
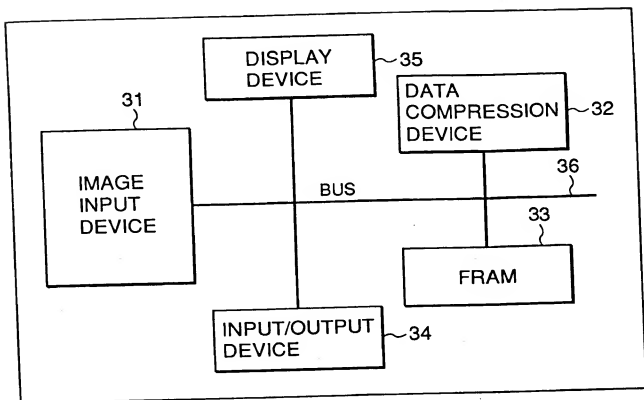


FIG. 14



DIGITAL IMAGE INPUT DEVICE

FIG. 15

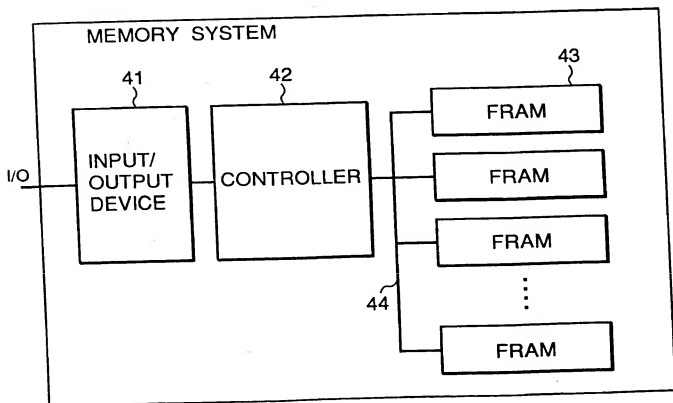


FIG. 16

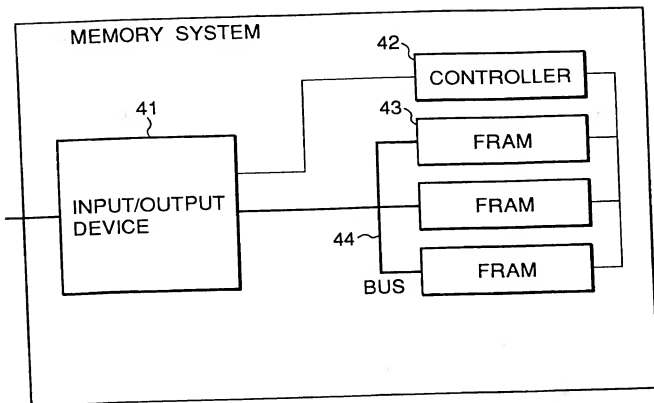


FIG. 17

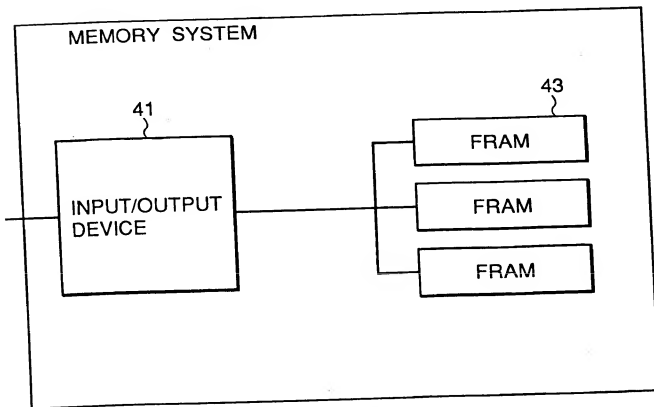


FIG. 18

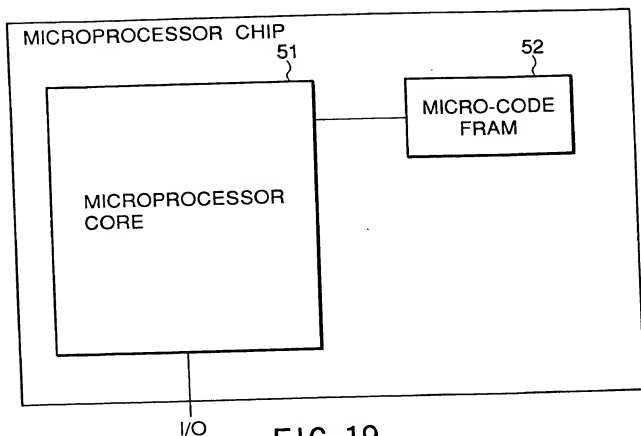


FIG. 19

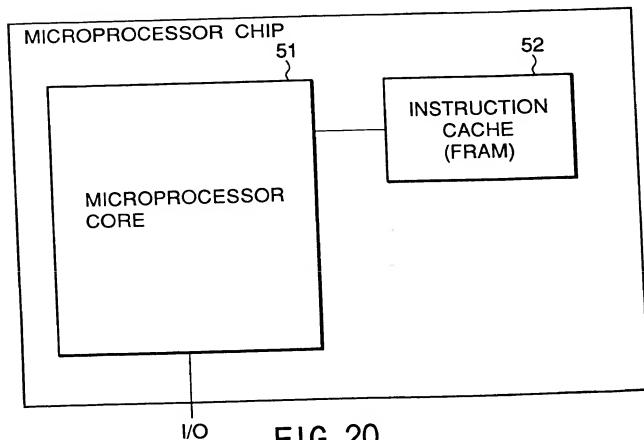


FIG. 20

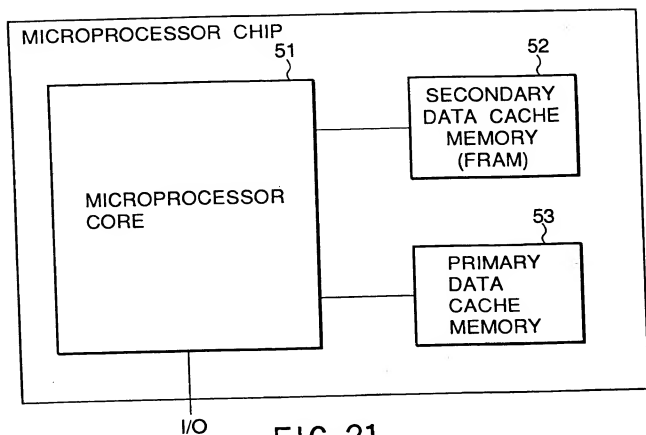


FIG. 21

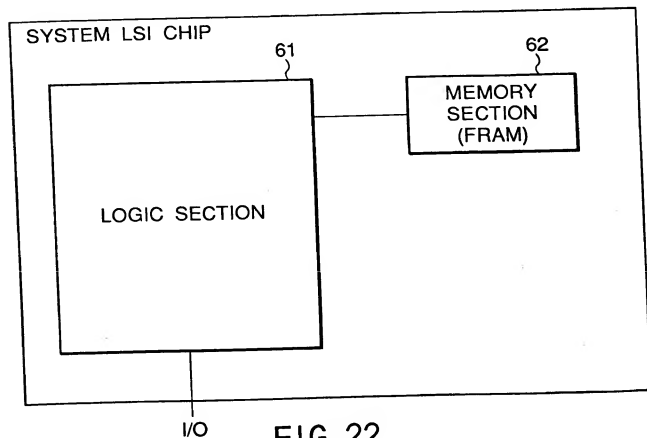


FIG. 22

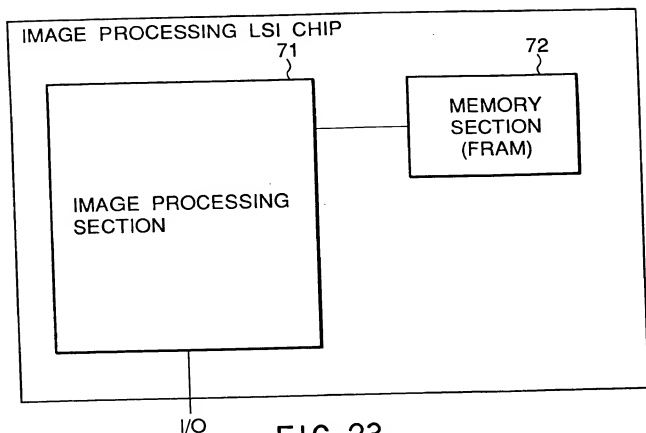


FIG. 23

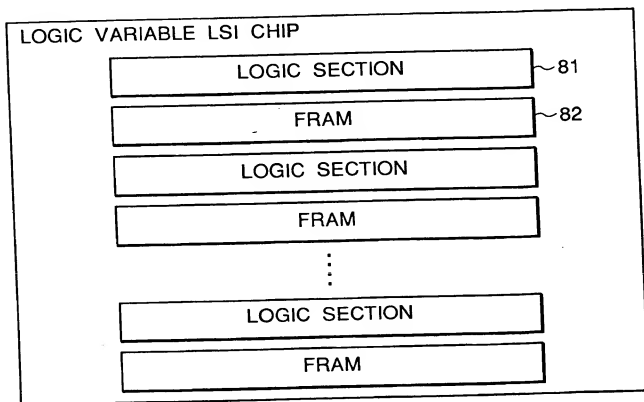


FIG. 24

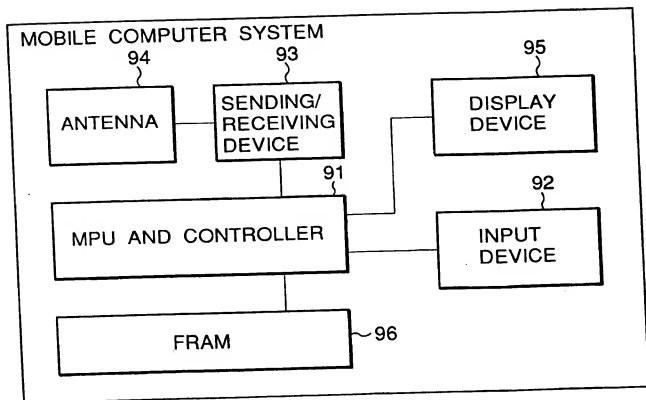


FIG. 25





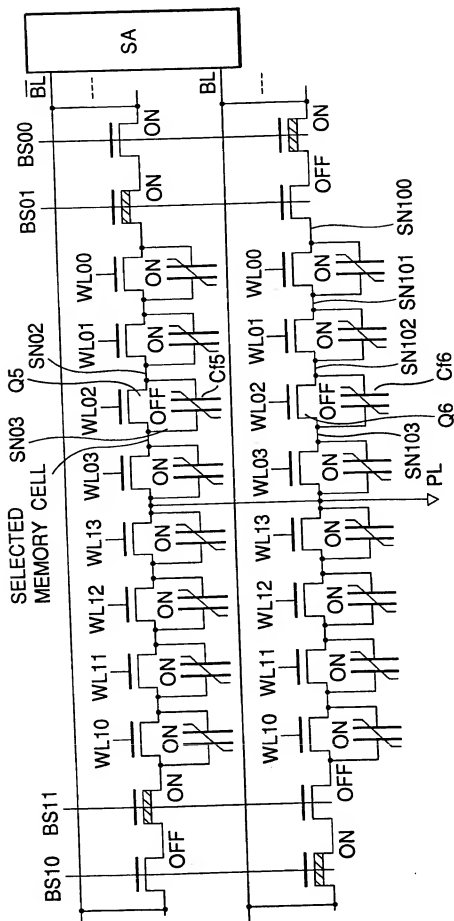


FIG. 27

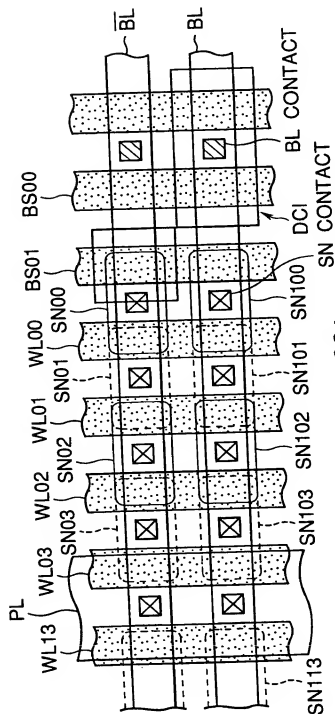


FIG. 28A

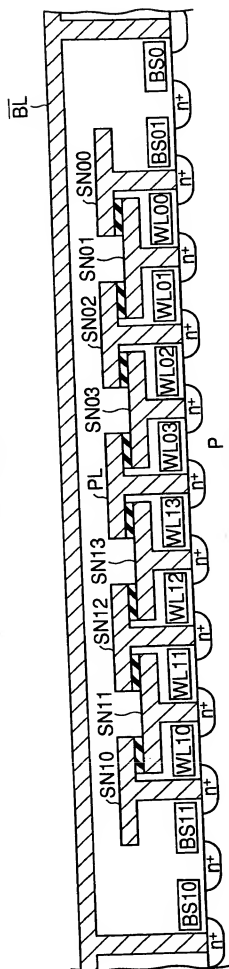


FIG. 28B

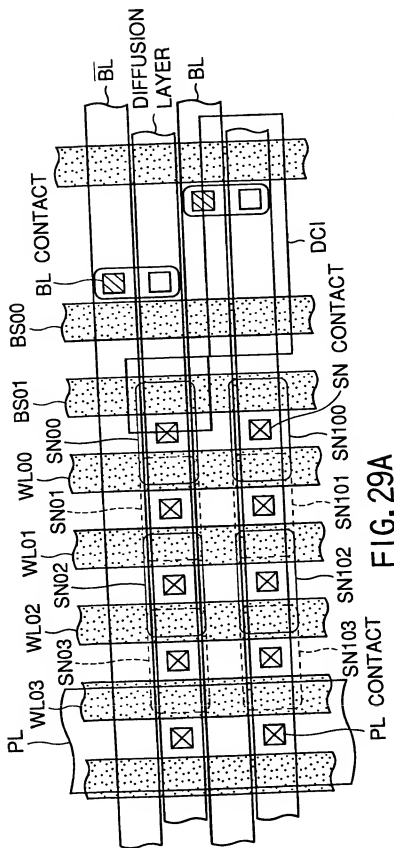


FIG. 29A

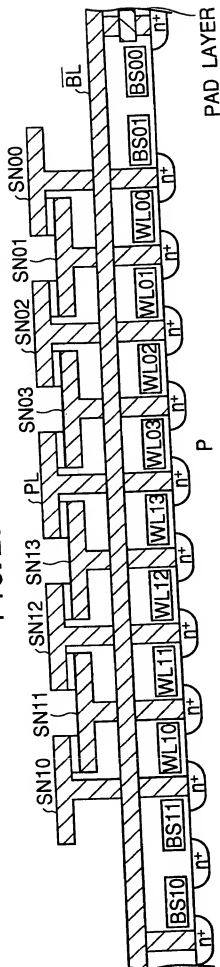


FIG. 29B

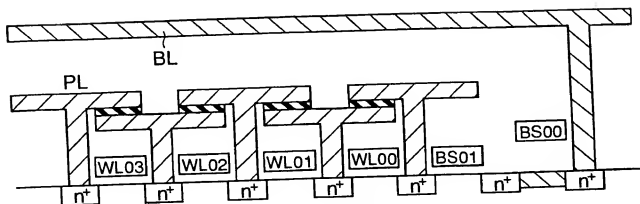


FIG. 30A

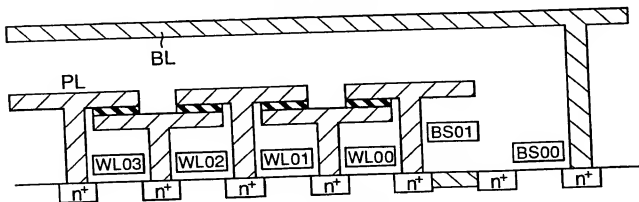


FIG. 30B

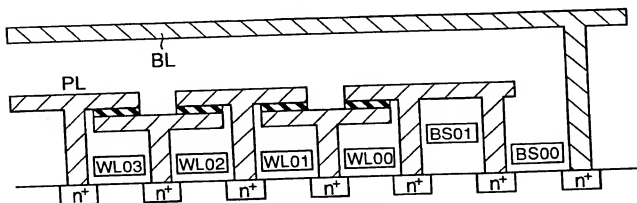


FIG. 30C

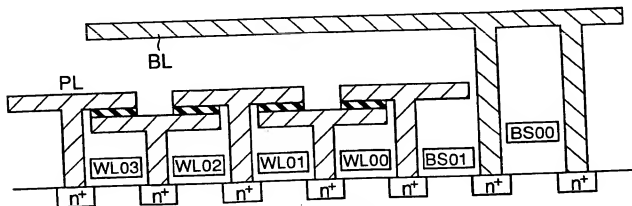


FIG. 30D

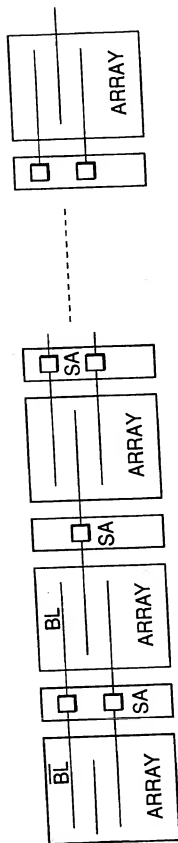


FIG. 31A

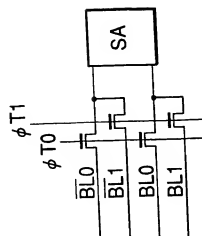


FIG. 31C

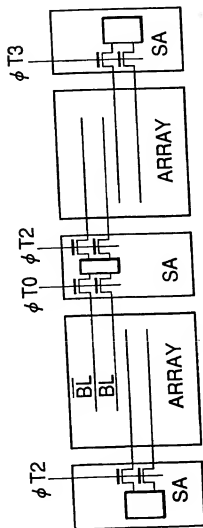


FIG. 31B

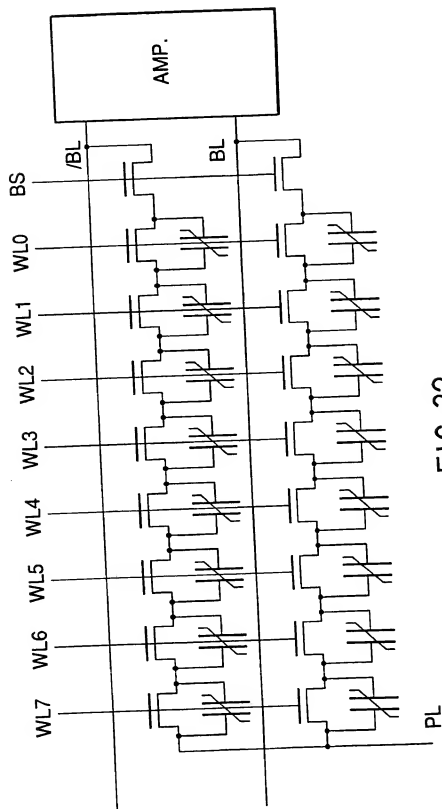


FIG. 32

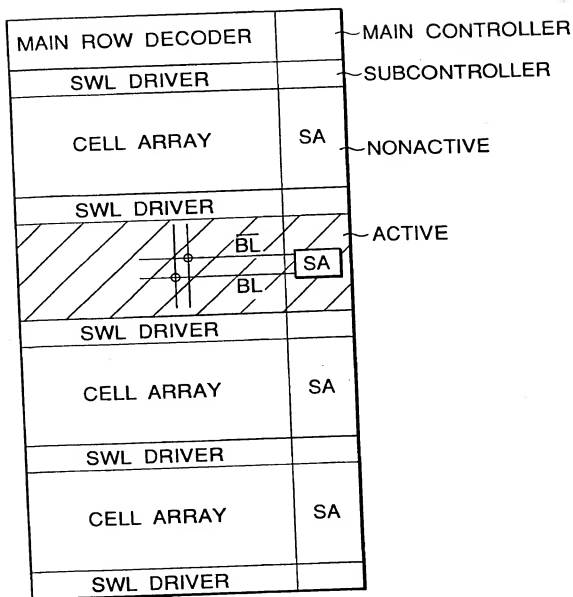


FIG. 33A

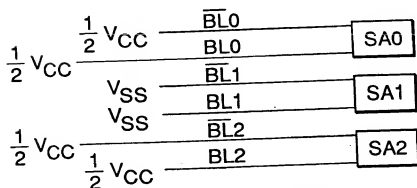
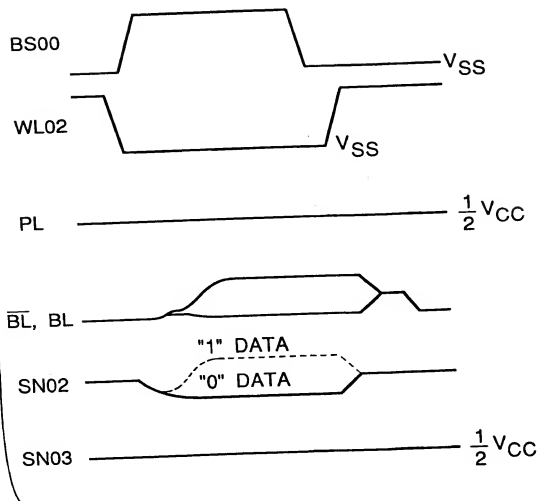
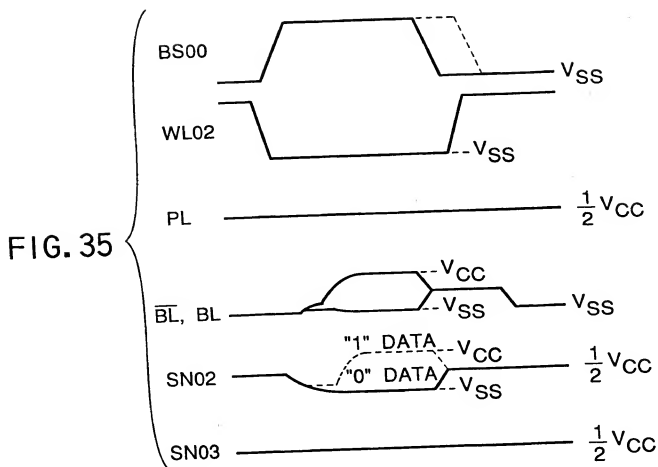


FIG. 33B



FIG. 34





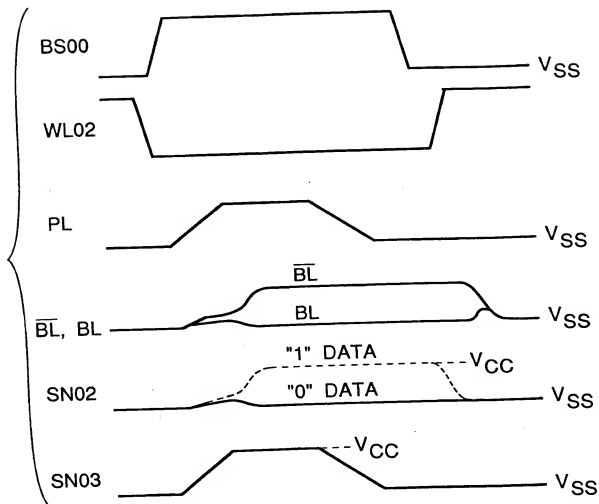


FIG. 36

	CHIP SIZE (COST)		TRANSISTOR STRUCTURE (EASE FOR PROCESS)	READ/WRITE METHOD (FLEXIBILITY)	NOISE (RELIABILITY)	(NO-) NONVOLATILE (PORTABILITY)
	CELL SIZE	BL CAPACITY (= CONSTANT)				
CONVENTIONAL 4F <sup>2</sup> CELL	⊙ 4F <sup>2</sup>	Δ LARGE (256WL/BL)	Δ 75~90%	⊙ RANDOM ACCESS	⊙ SMALL (2-LAYER FOLDED BL)	⊙ USABLE NONVOLATILE CELL
CONVENTIONAL NAND CELL	⊙ 4.5~5F <sup>2</sup> (4~2NAND)	○ MIDDLE (512WL/BL)	○ 71~74%	⊙ BLOCK ACCESS	⊙ SMALL (FOLDED BL BY ADDING BS)	⊙ USABLE NONVOLATILE CELL
PRESENT INVENTION	⊙ 4.5~5F <sup>2</sup>	⊙ SMALL (1024WL/BL)	⊙ 62.5~64%	⊙ RANDOM ACCESS	⊙ SMALL	⊙ NONVOLATILE CELL
CONVENTIONAL 8F <sup>2</sup> CELL	⊙ 8F <sup>2</sup>	○ MIDDLE (512WL/BL)	⊙ 100%	⊙ RANDOM ACCESS	⊙ SMALL (FOLDED BL)	⊙ USABLE NONVOLATILE CELL

NOTE)  
NESTING≤4

NOTE)

BL IS MADE TO DOUBLE LAYERED

COST INCREASES 7%

MEMORY CELL 60%

SA 20%

PERIPHERAL CIRCUIT 20%

CONDITION IN 100% CHIP

FIG. 37

		PLATE ELECTRODE DRIVING (SPEED, POWER)	REFRESH OPERATION (POWER, BUSY RATE)
CONVENTIONAL FRAM	CASE 1	EXIST $\times$	UNNECESSARY $\odot$
	CASE 2	$\frac{1}{2} V_{CC}$ FIXED $\odot$	NECESSARY $\times$
PRESENT INVENTION		$\frac{1}{2} V_{CC}$ FIXED $\odot$	UNNECESSARY $\odot$

FIG.38

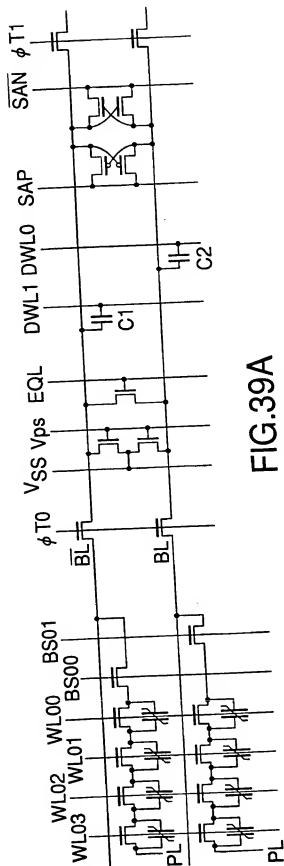


FIG. 39A

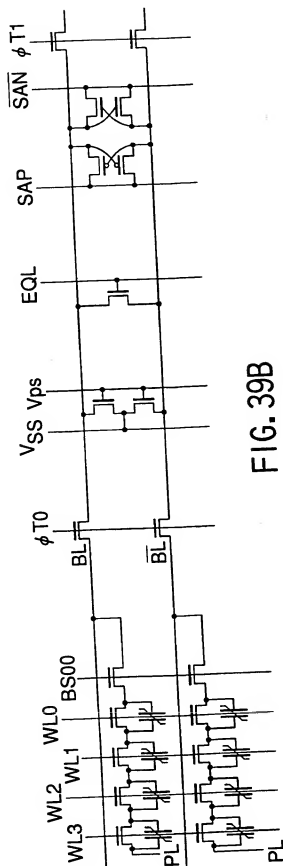
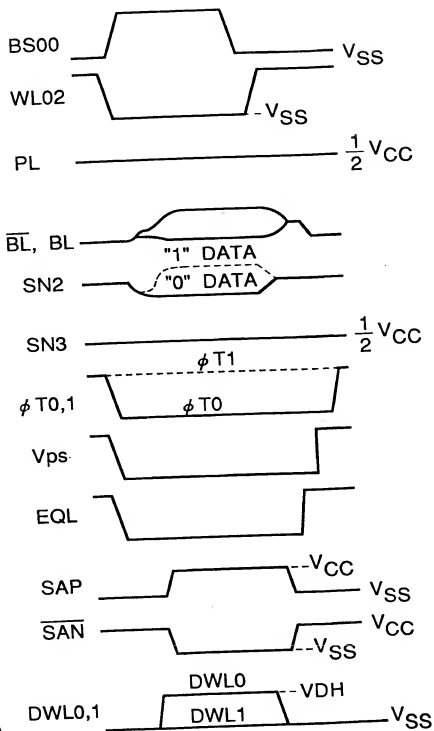


FIG. 39B

FIG. 40



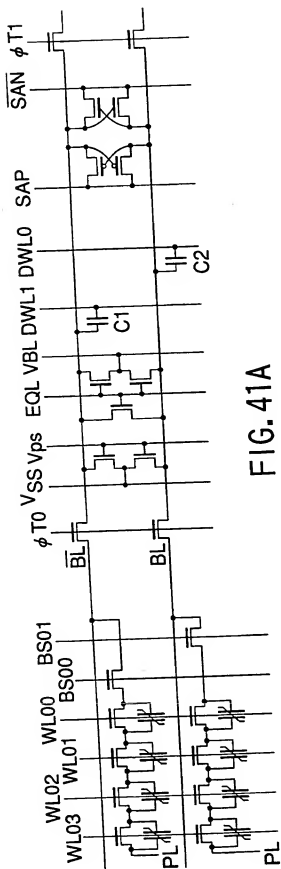


FIG. 41A

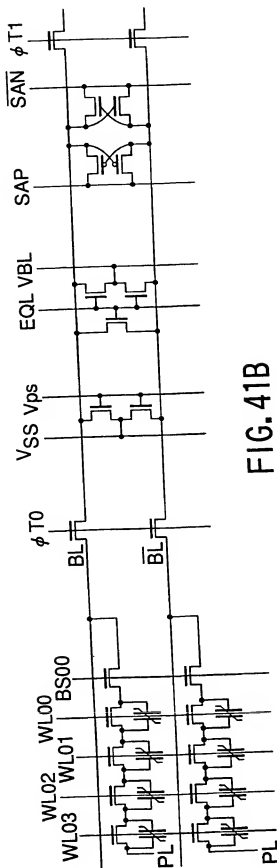
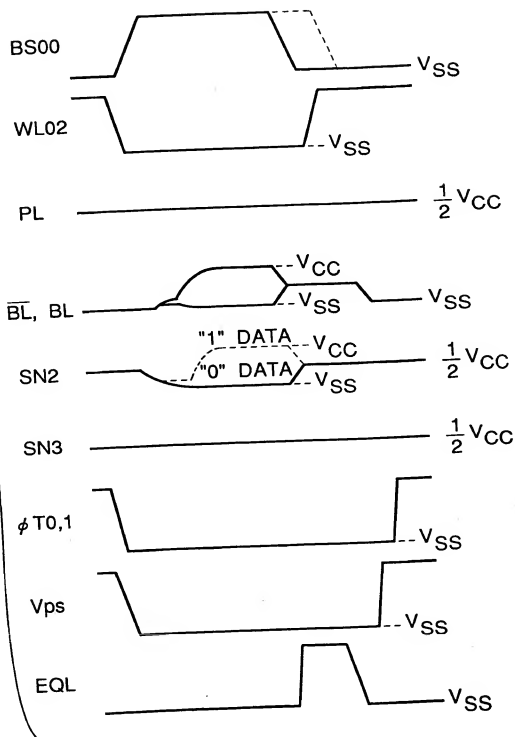


FIG. 41B



FIG. 42



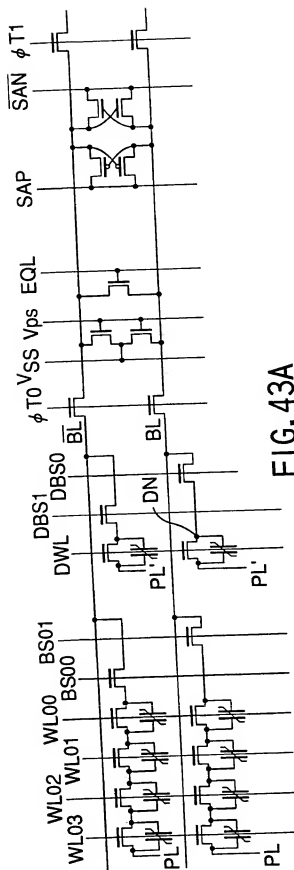


FIG. 43A

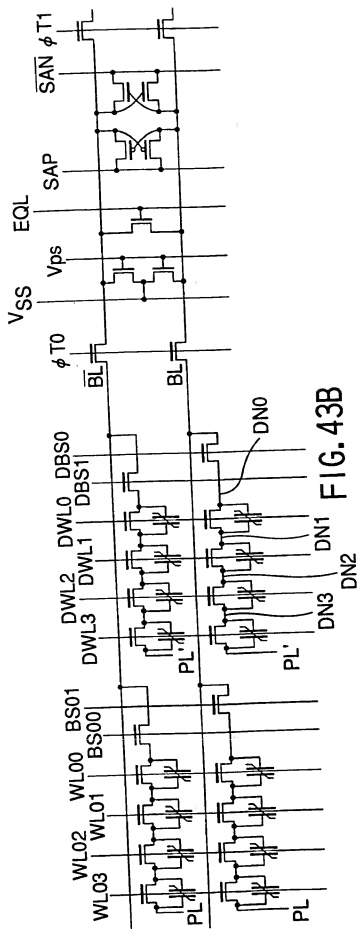
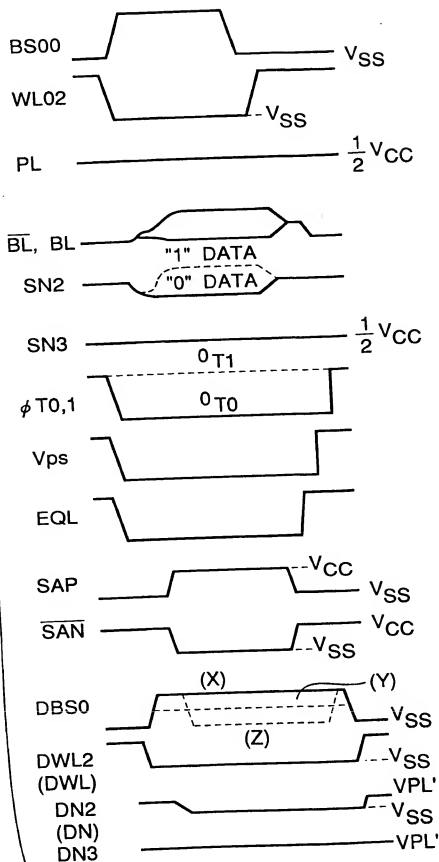


FIG. 43B

FIG. 44



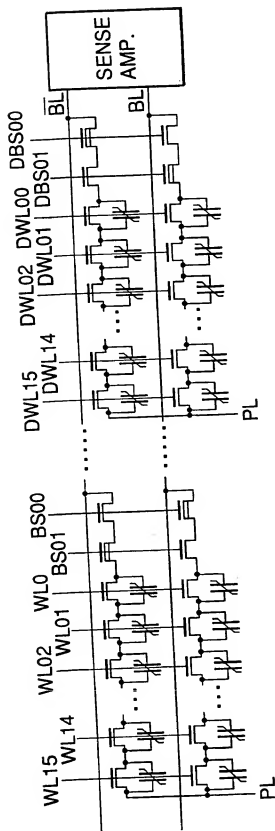


FIG. 45A

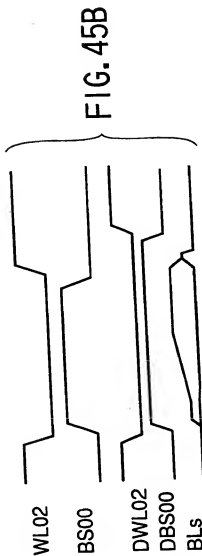


FIG. 45B

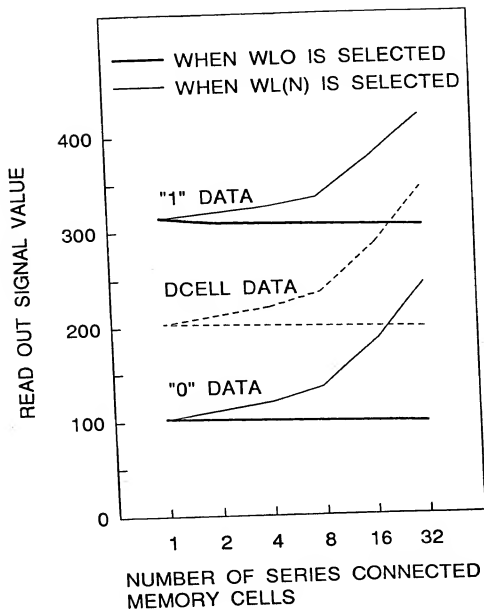


FIG.46

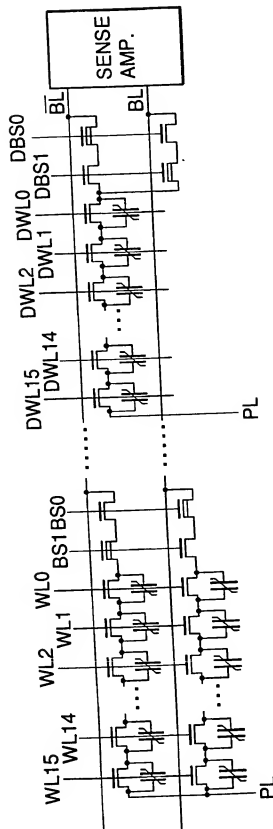
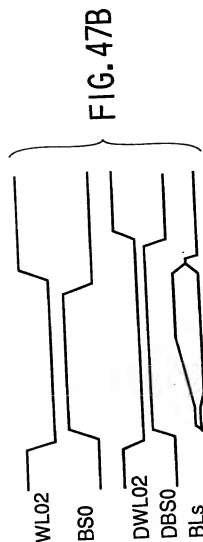


FIG. 47A



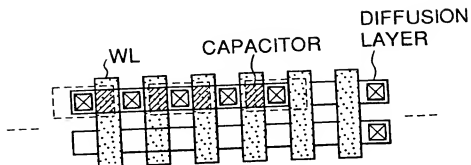


FIG. 48A

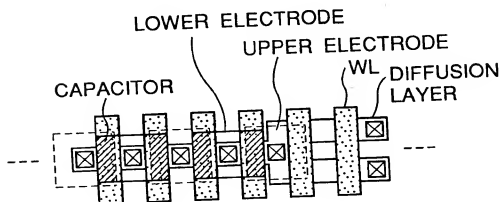


FIG. 48B

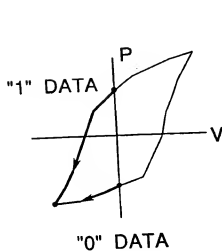


FIG. 48C

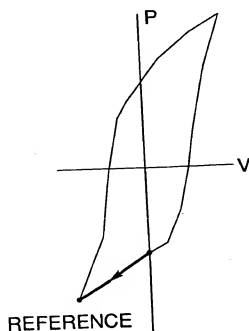


FIG. 48D

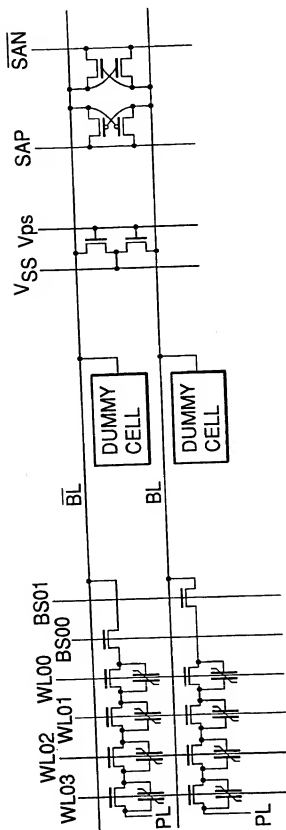


FIG. 49



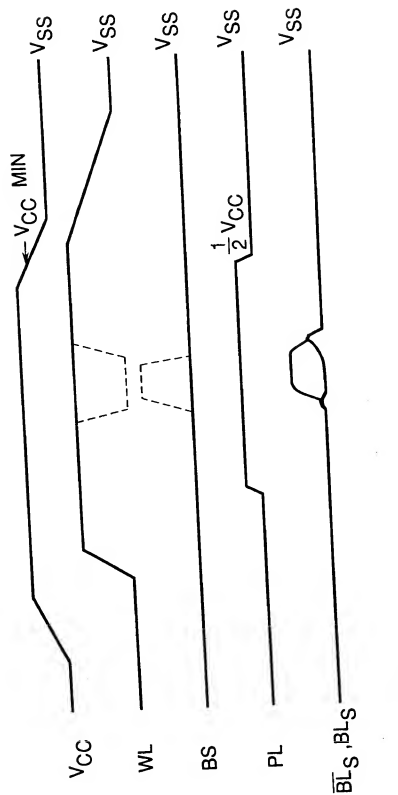
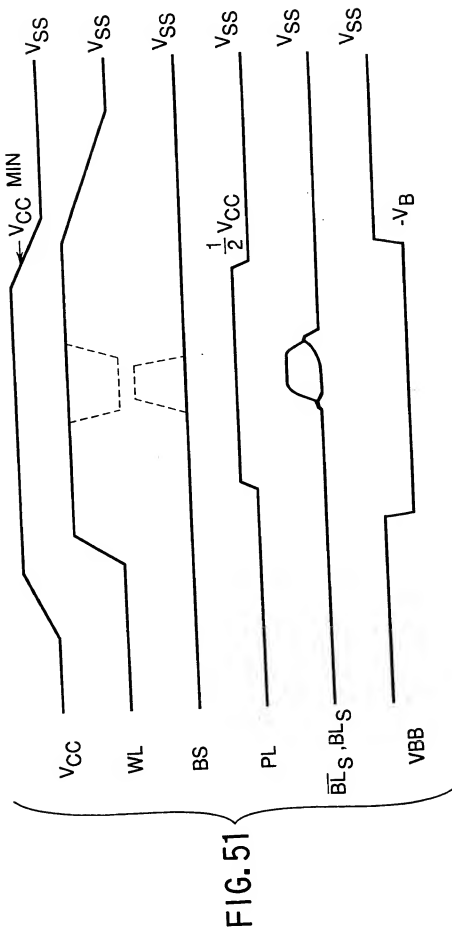


FIG. 50



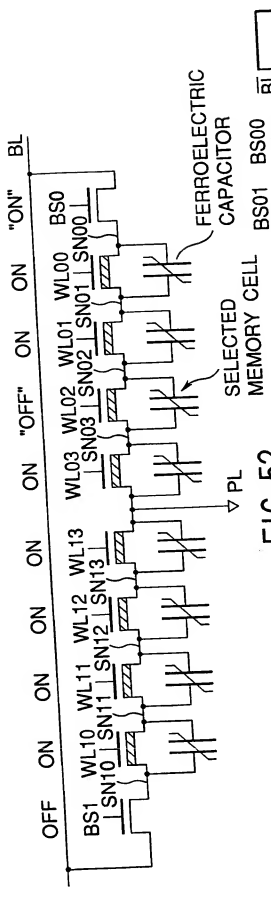


FIG. 52

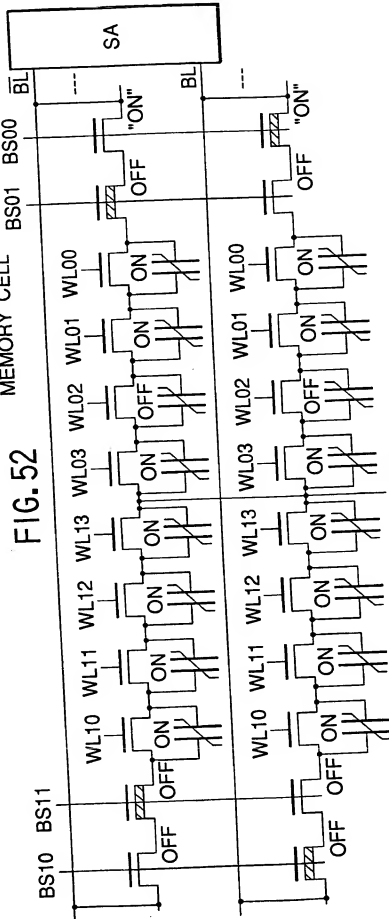
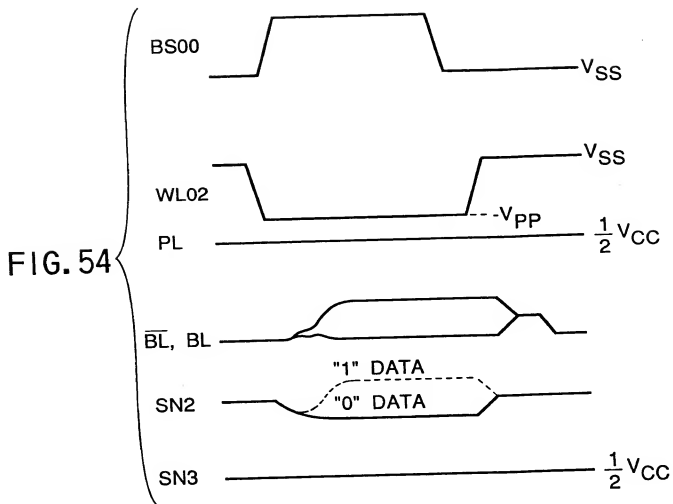


FIG. 53



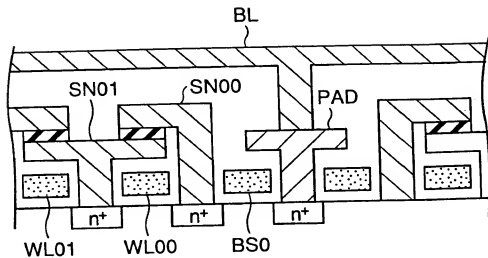


FIG. 55A

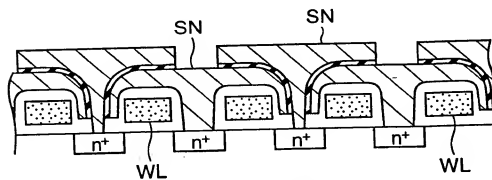


FIG. 55B

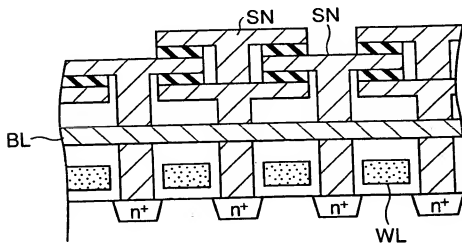


FIG. 55C

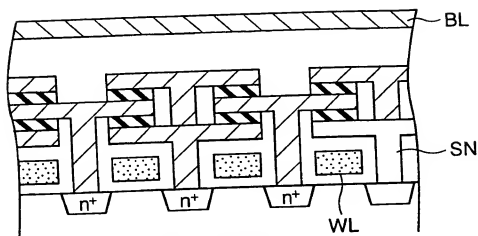


FIG. 55D

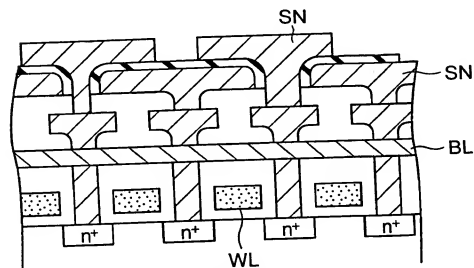


FIG. 55E

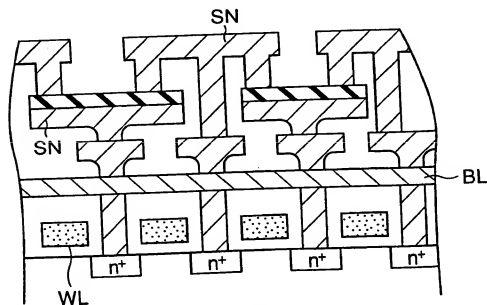


FIG. 55F

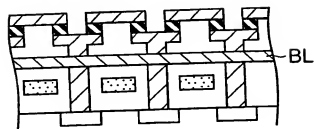


FIG. 55G

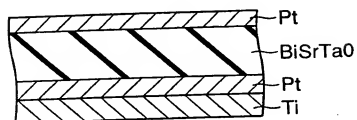


FIG. 55H

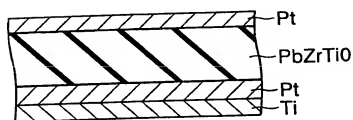


FIG. 55I

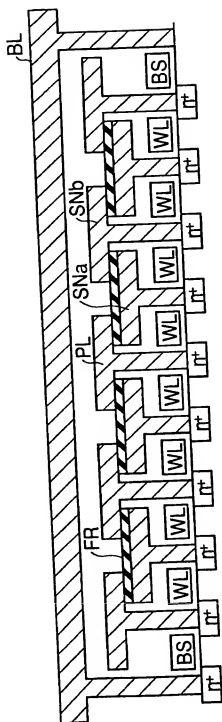


FIG. 56

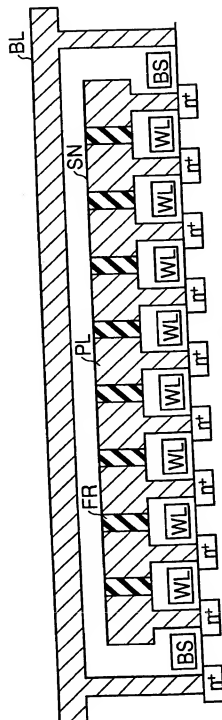


FIG. 58



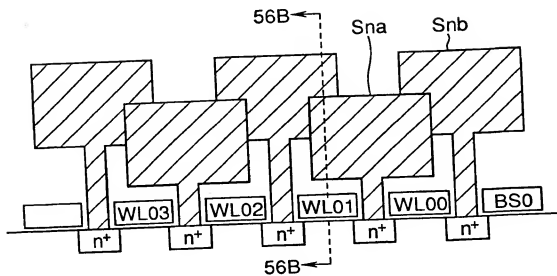
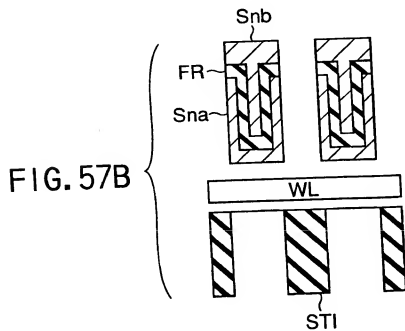
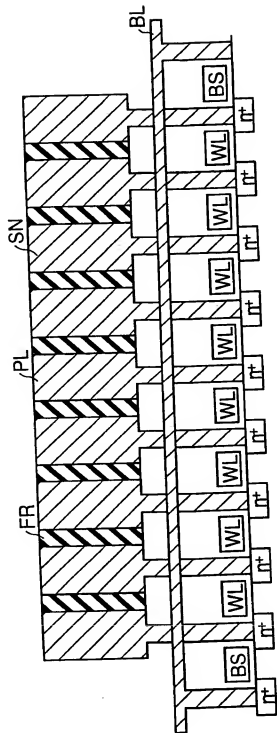
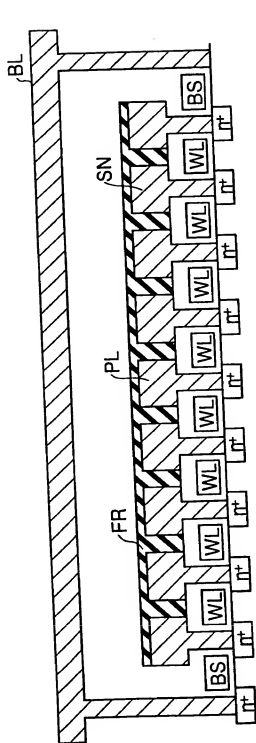


FIG. 57A





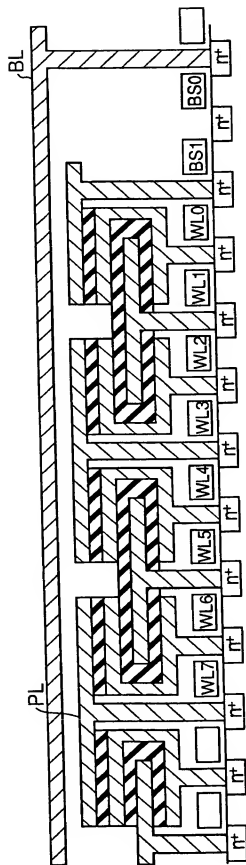


FIG. 61

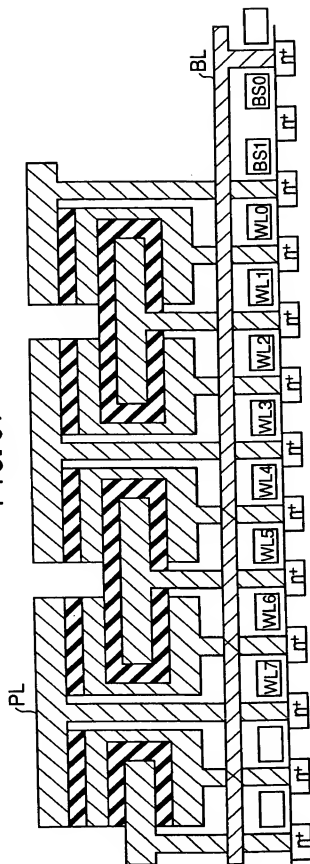
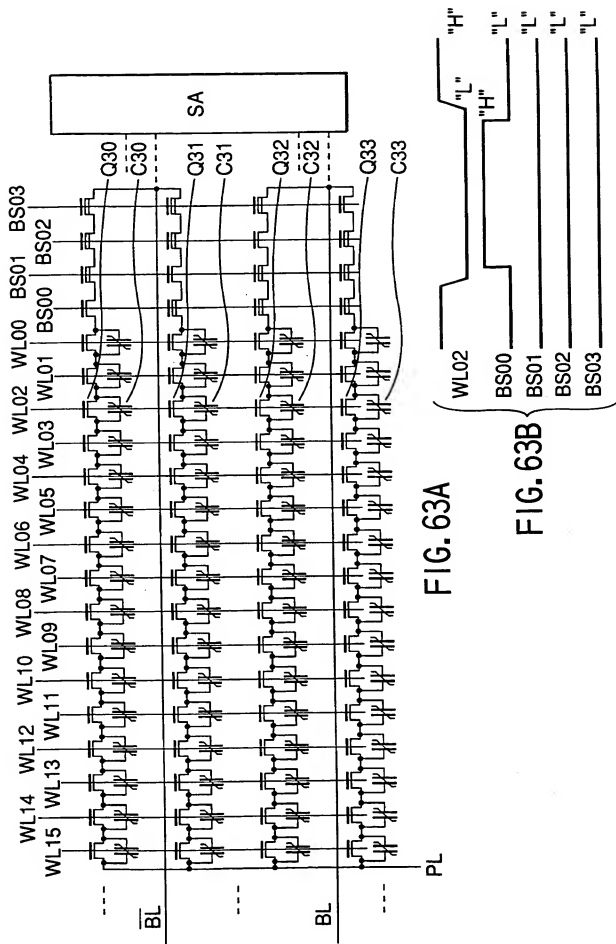


FIG. 62



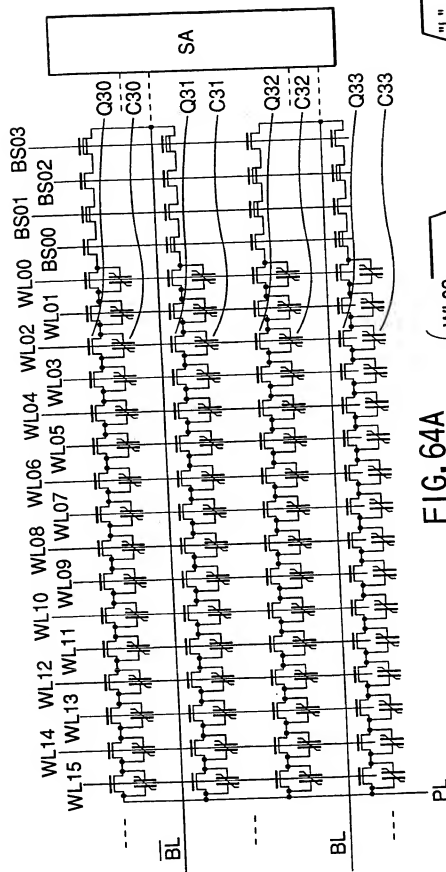


FIG. 64A

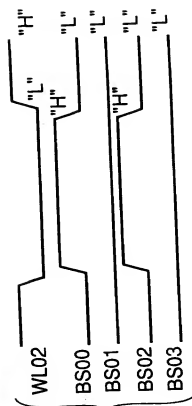


FIG. 64B

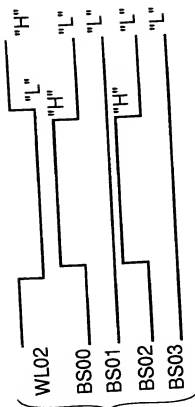
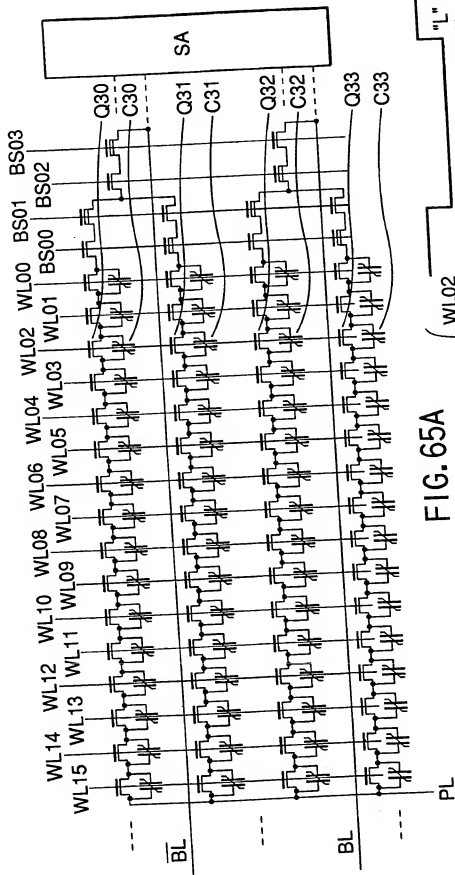


FIG. 65A

FIG. 65B

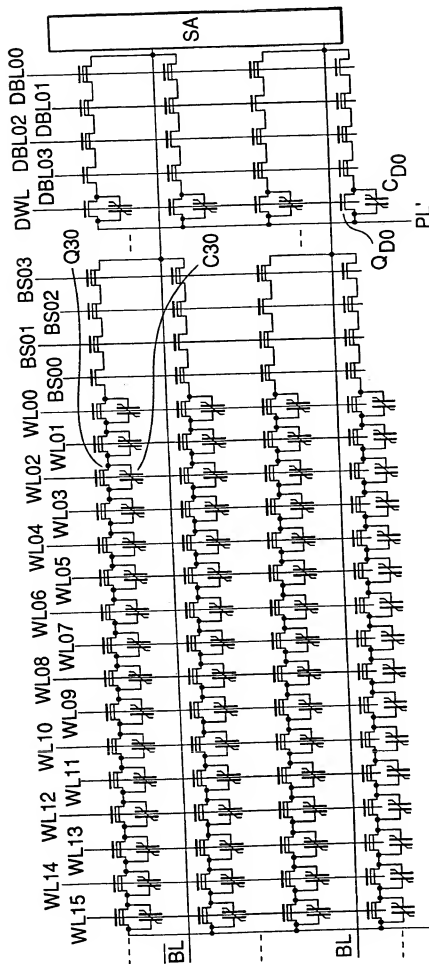


FIG. 66A

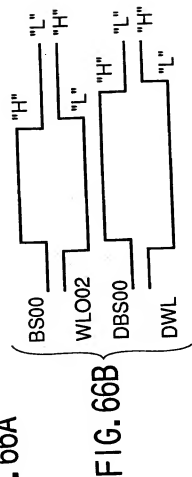


FIG. 66B

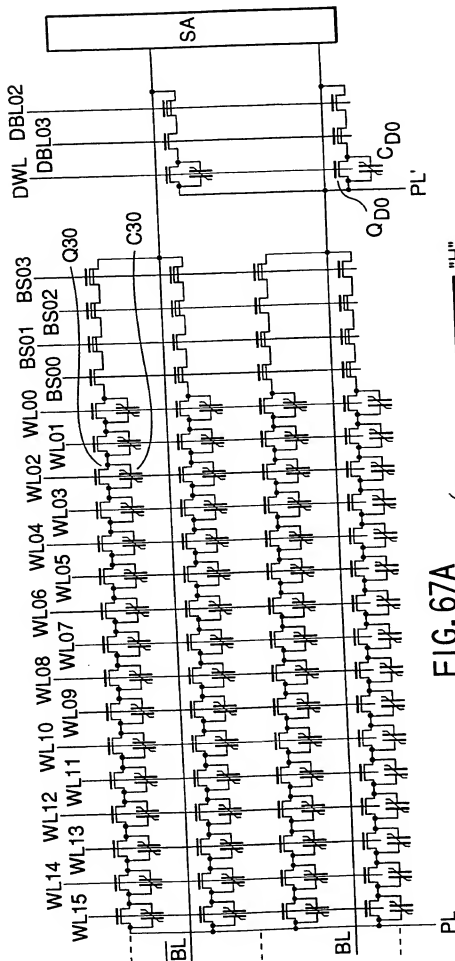


FIG. 67A

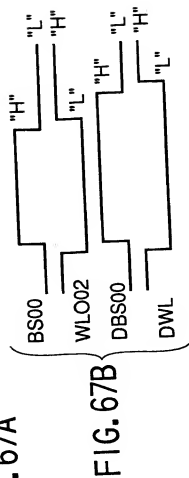


FIG. 67B



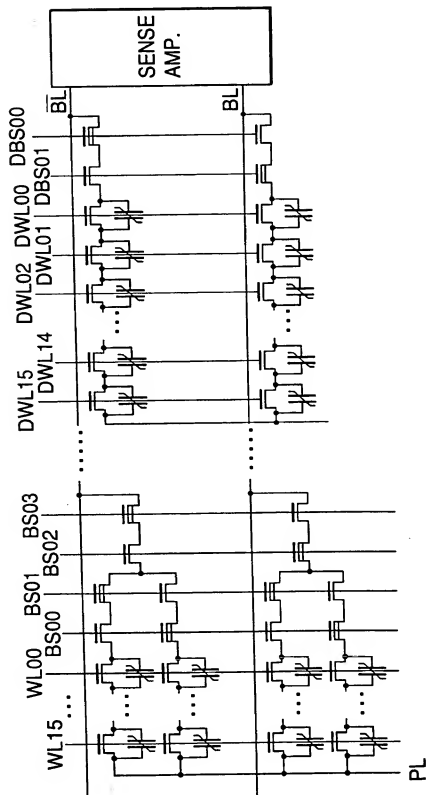
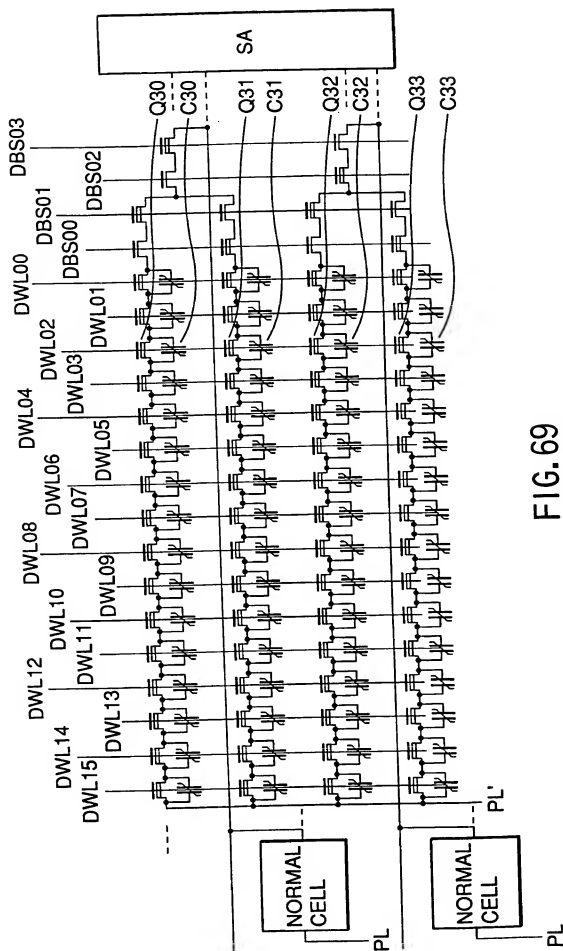
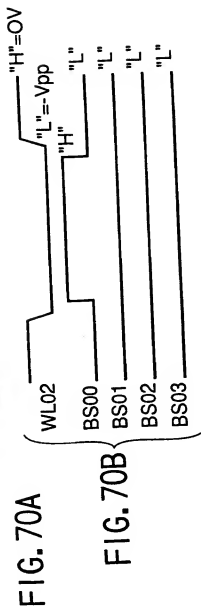
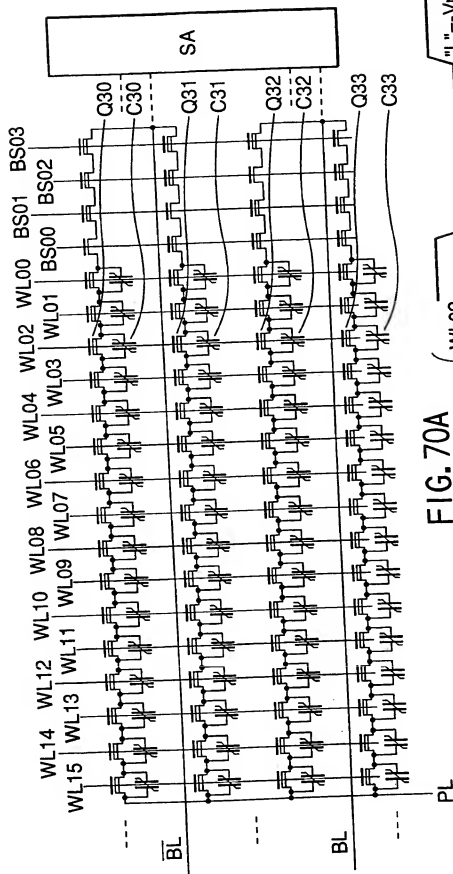
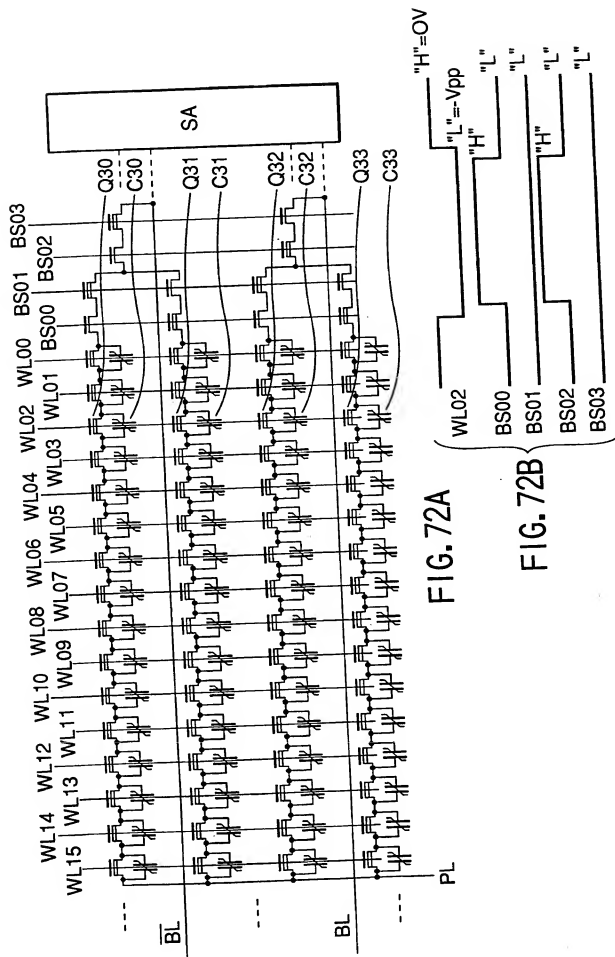


FIG. 68









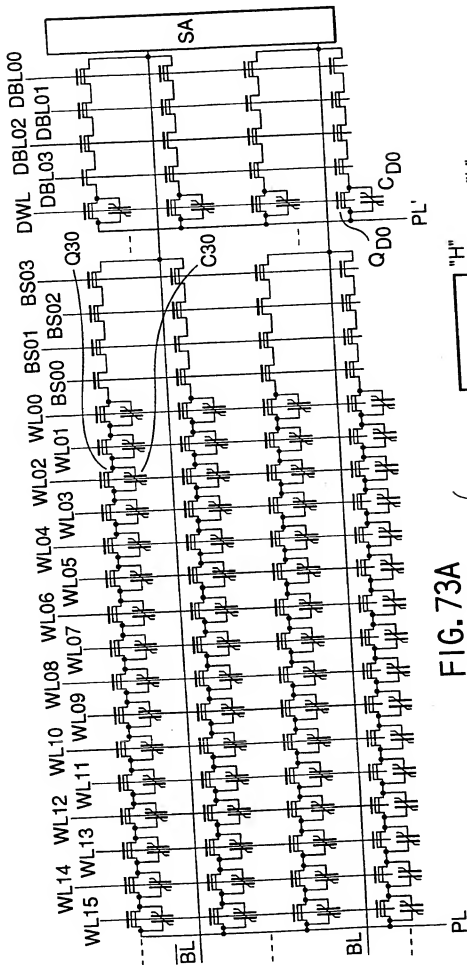


FIG. 73A

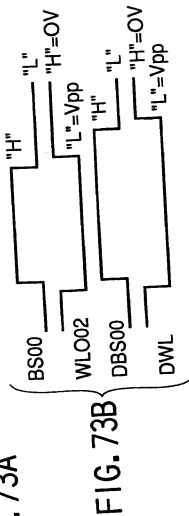
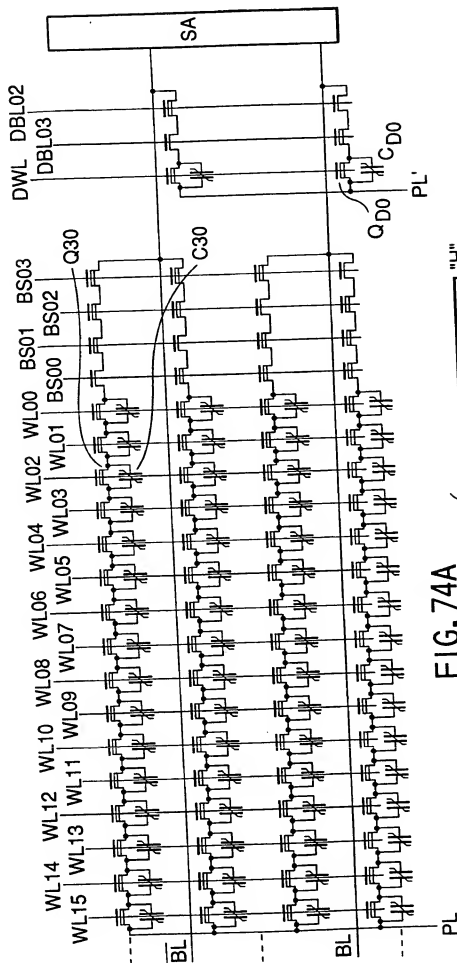


FIG. 73B



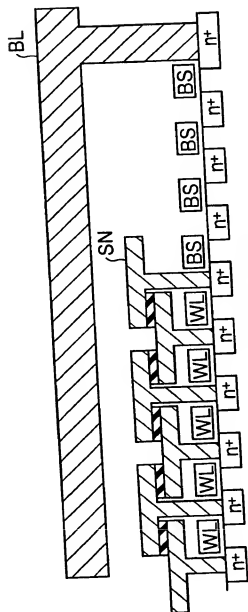


FIG. 75A

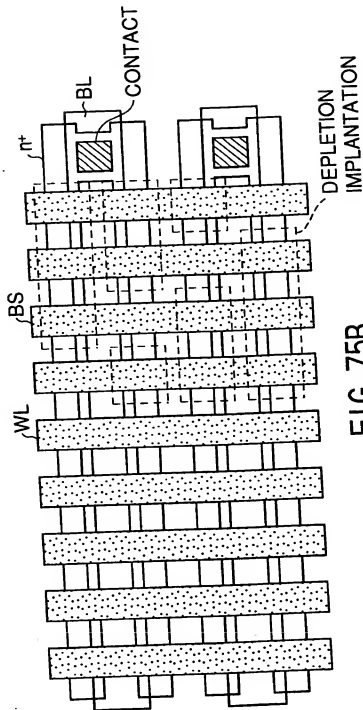


FIG. 75B



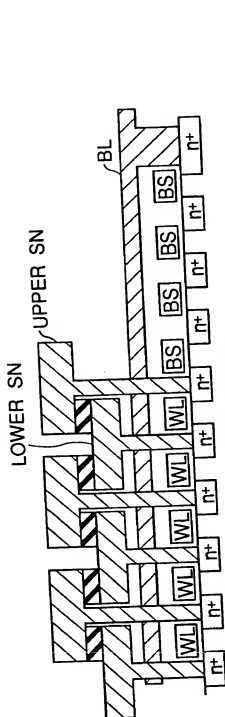


FIG. 76A

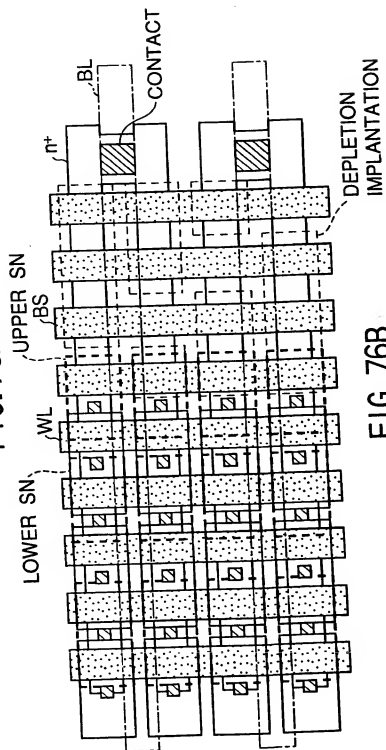


FIG. 76B

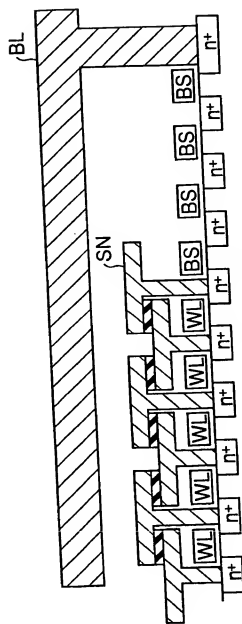


FIG. 77A

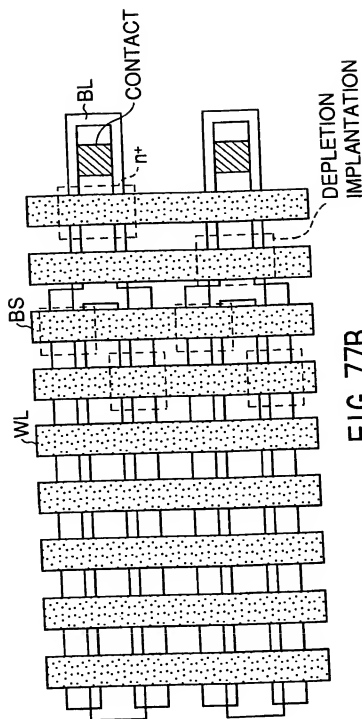


FIG. 77B

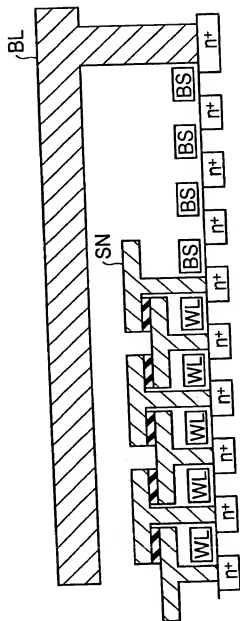


FIG. 78A

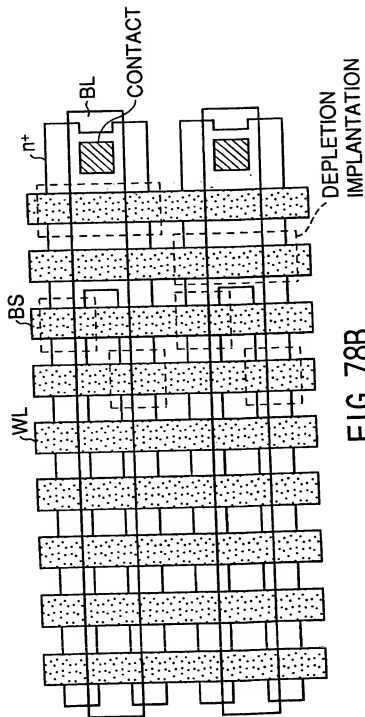


FIG. 78B

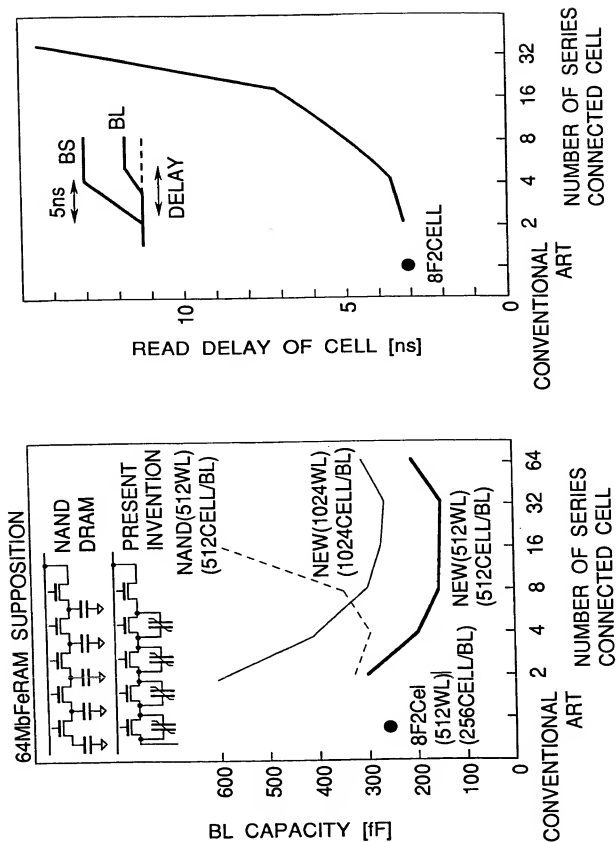


FIG. 79B

FIG. 79A

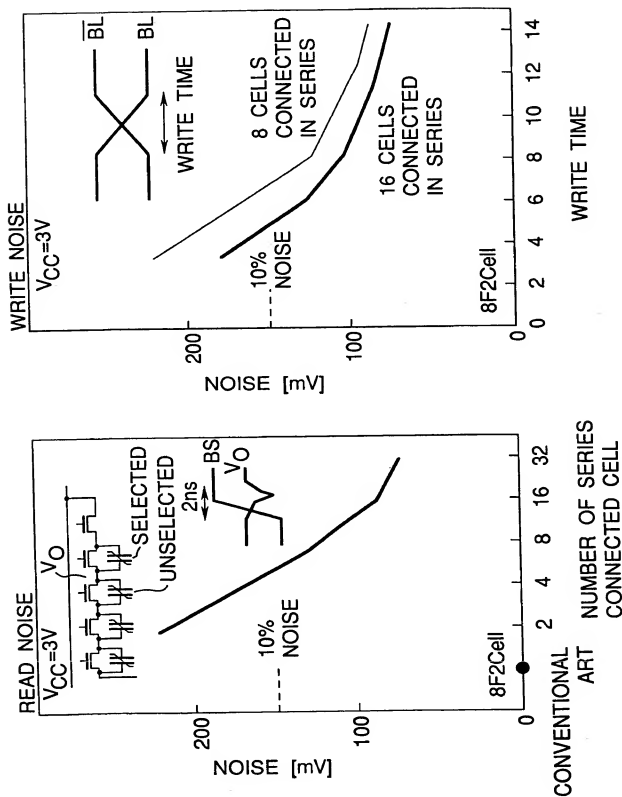


FIG. 80B

FIG. 80A

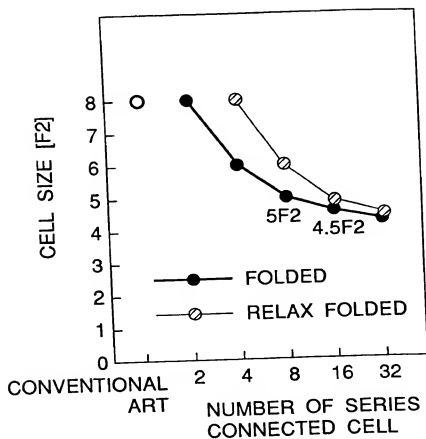


FIG. 81A

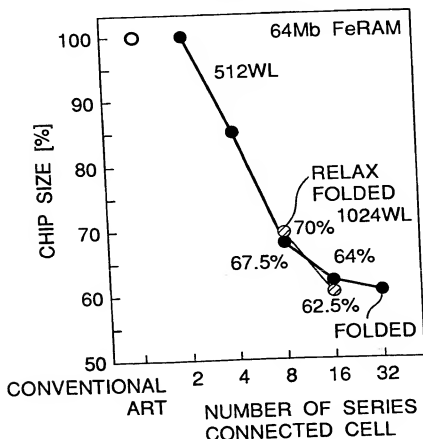


FIG. 81B

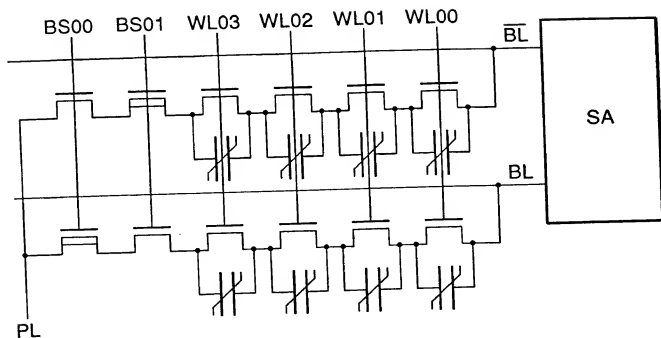


FIG. 82

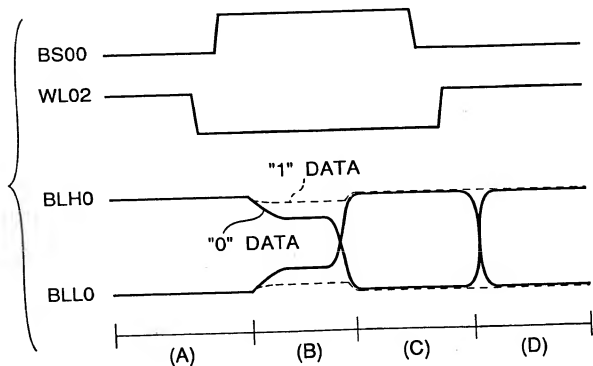


FIG. 84

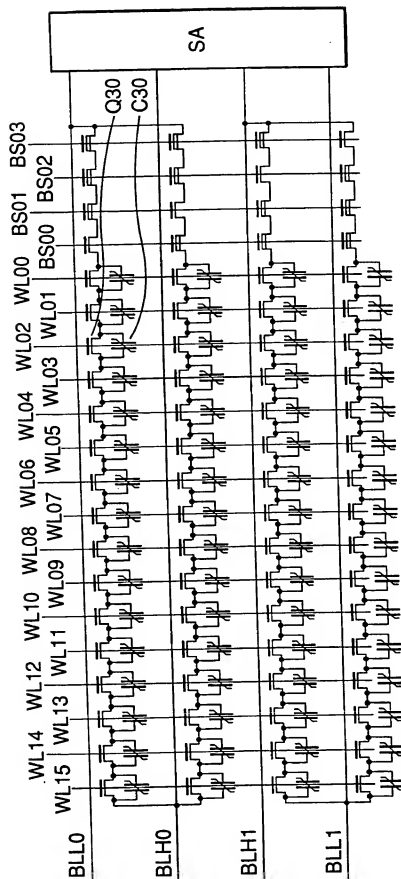


FIG. 83



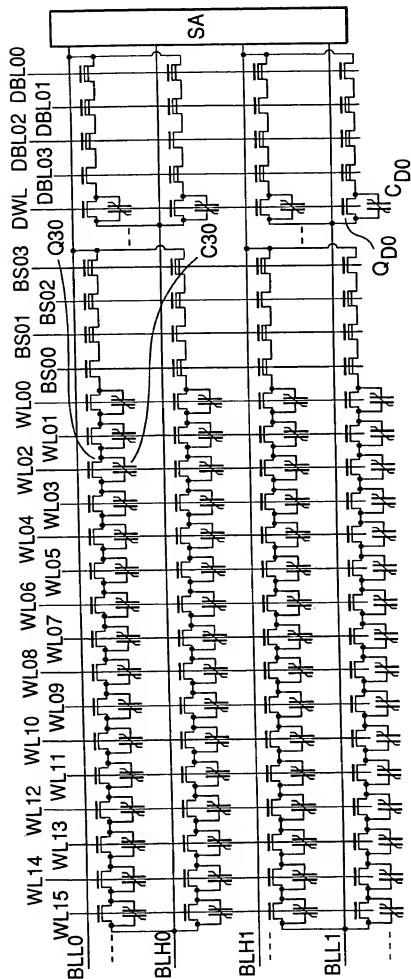


FIG. 85

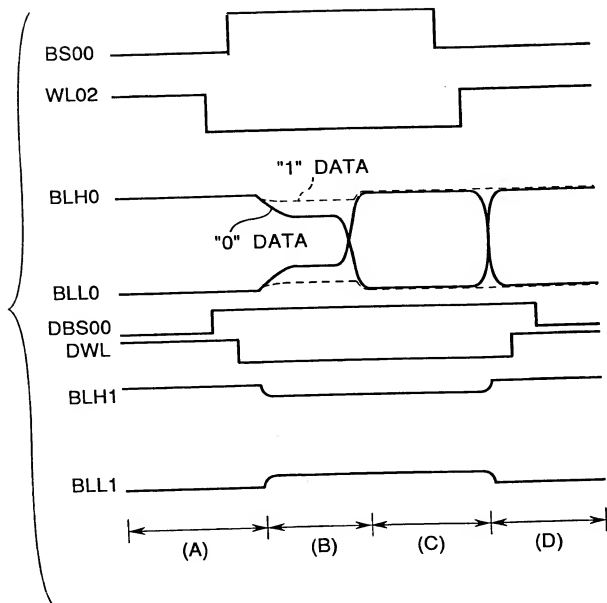


FIG. 86

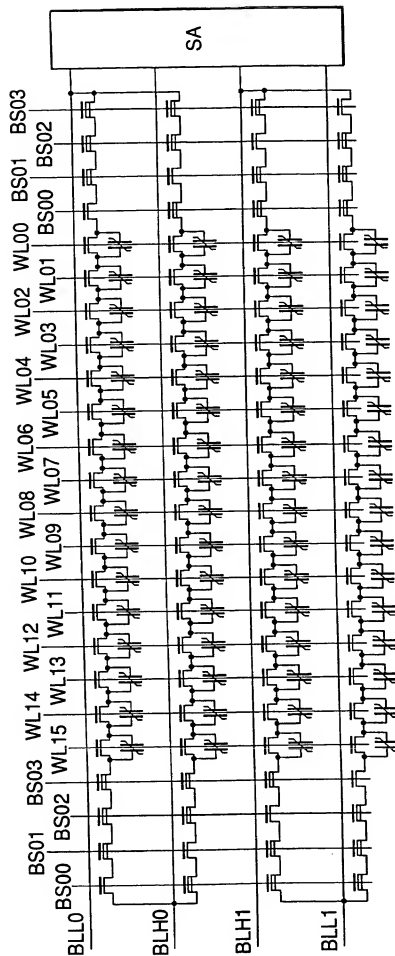


FIG. 87

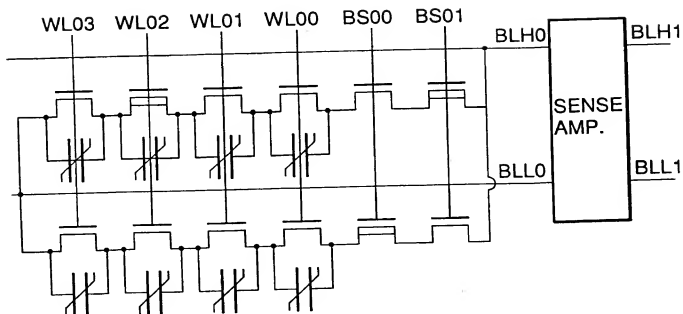


FIG. 88

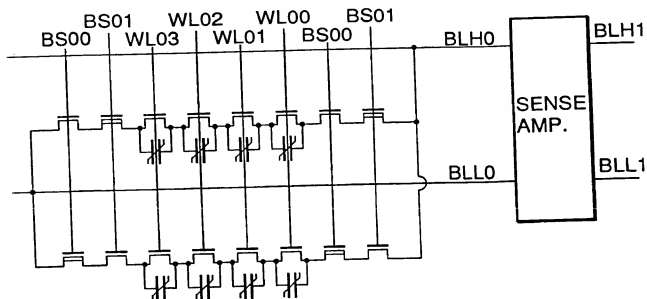


FIG. 89

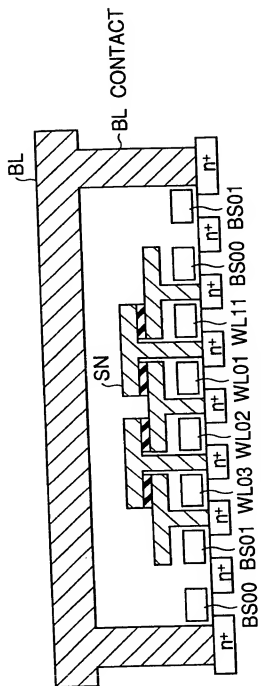


FIG. 90A

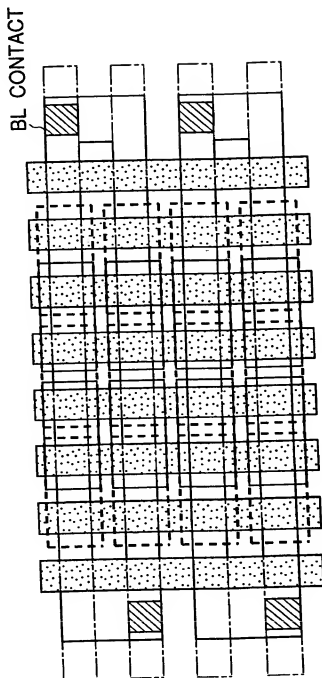


FIG. 90B

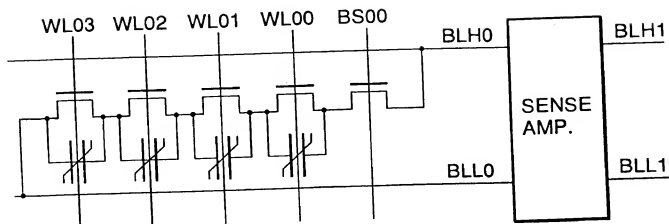


FIG. 91

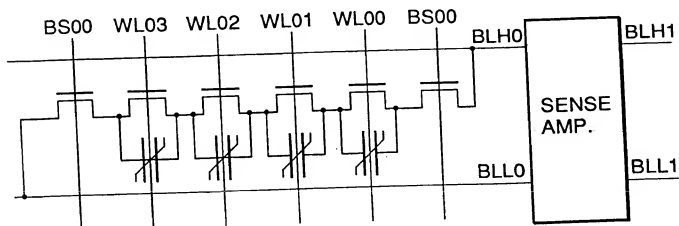


FIG. 92

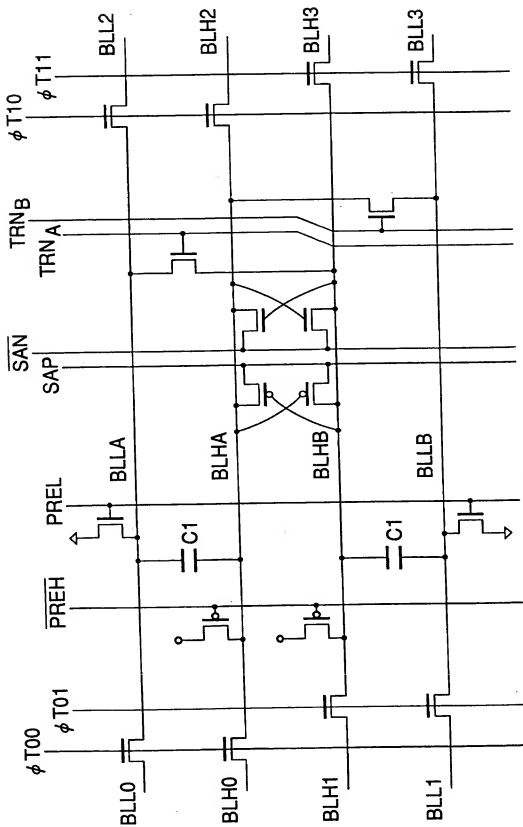
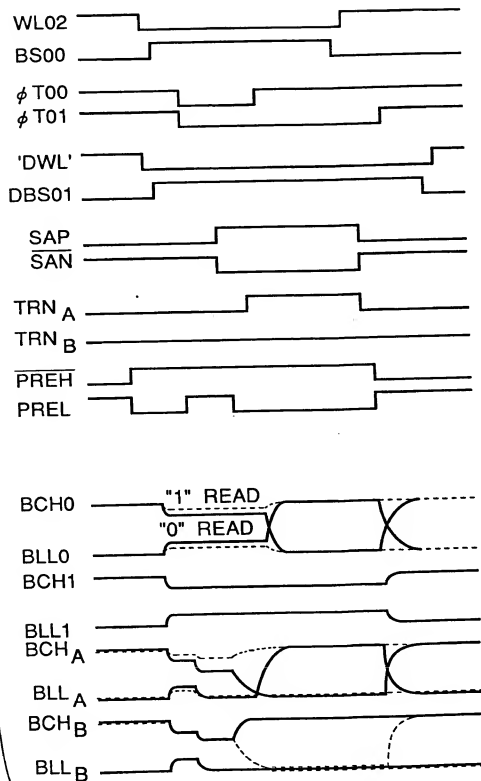


FIG. 93

FIG. 94





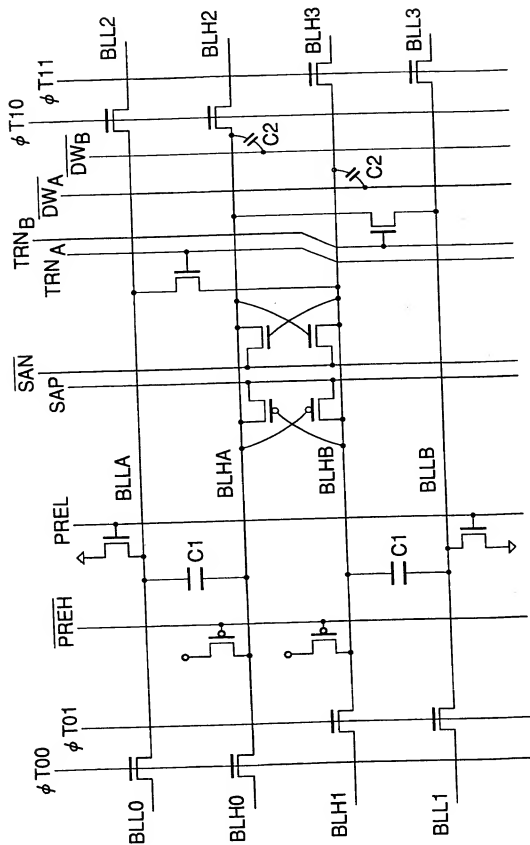
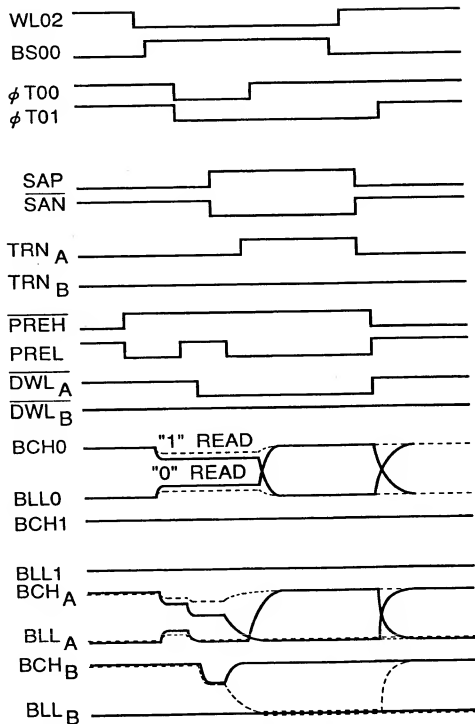


FIG. 95

FIG. 96



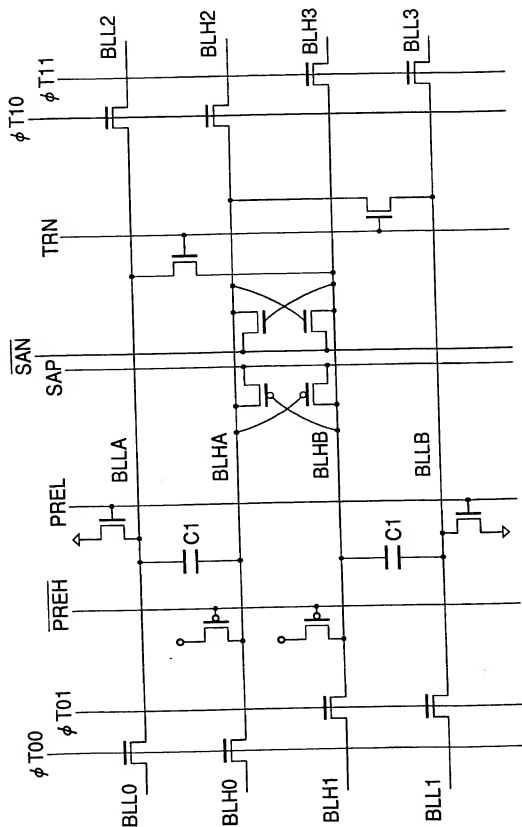
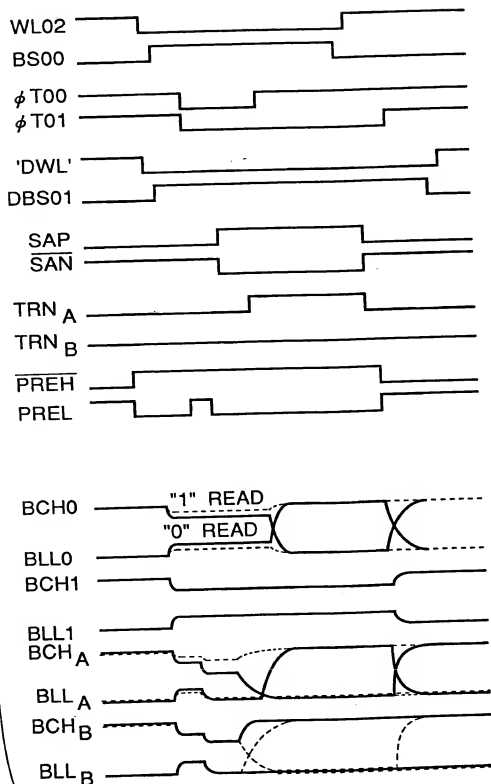


FIG. 97

FIG. 98



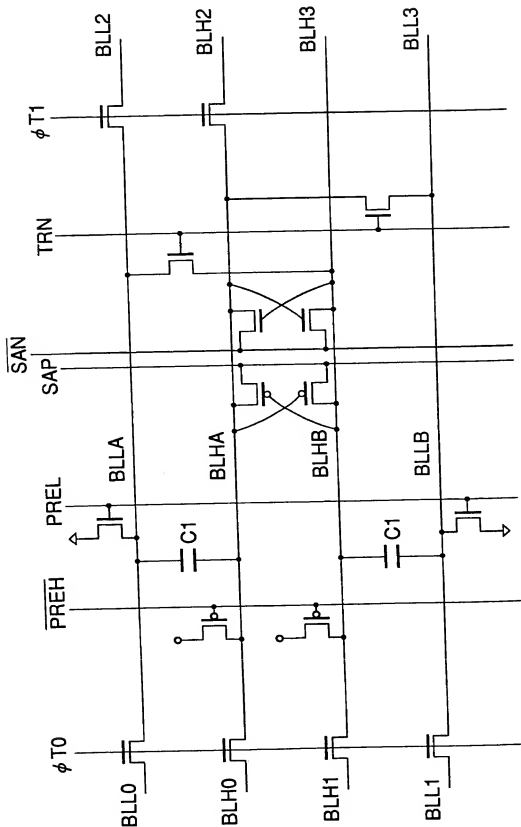
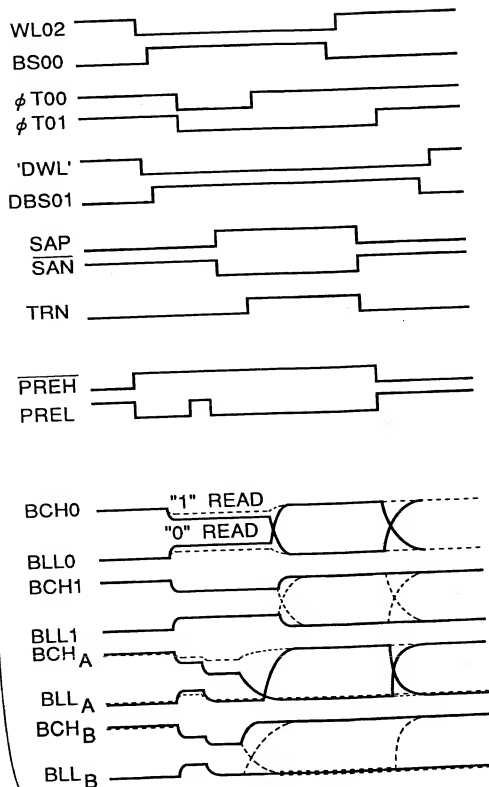


FIG. 99

FIG. 100



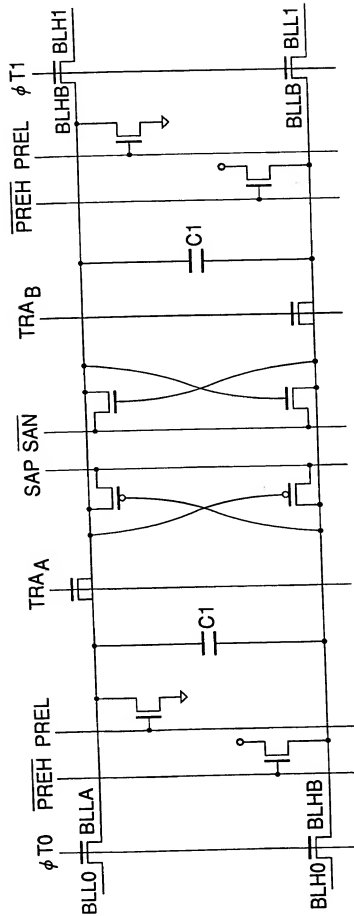


FIG. 101

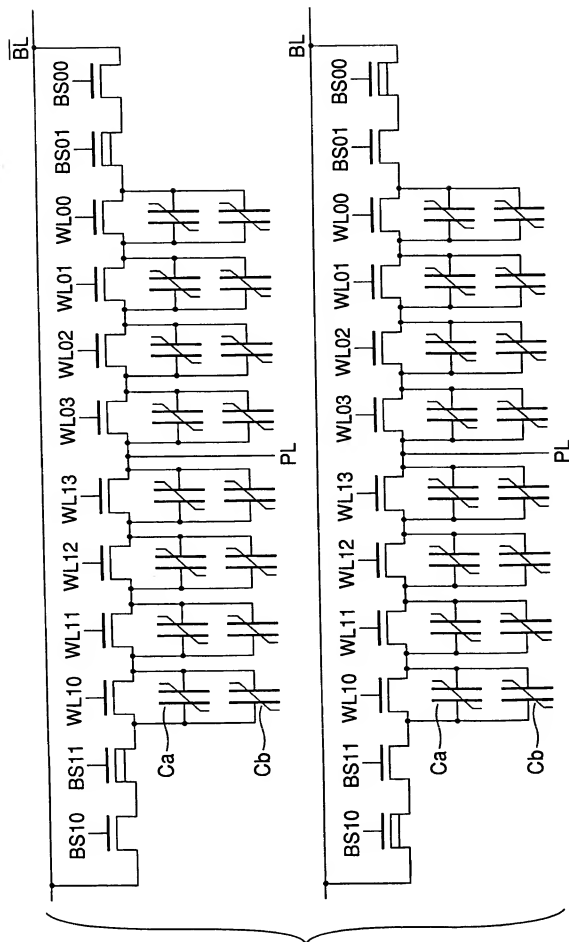


FIG. 102



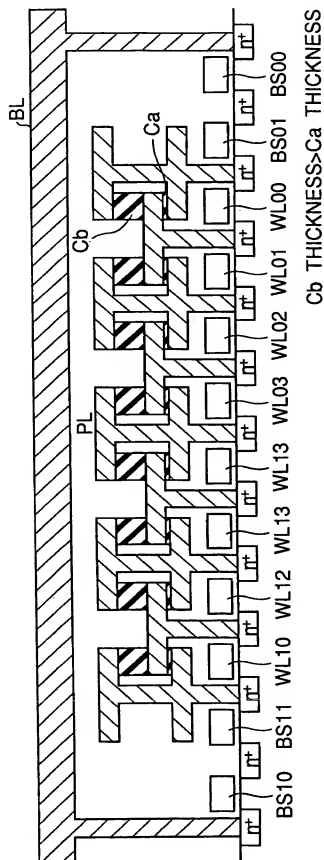


FIG. 103

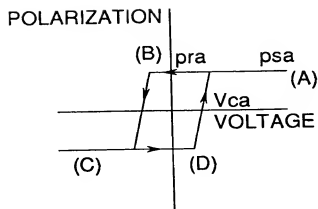


FIG. 104A

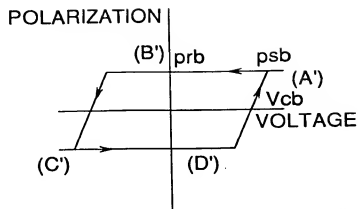


FIG. 104B

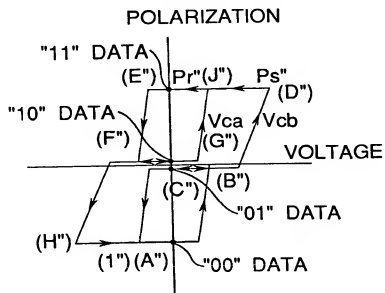


FIG. 104C

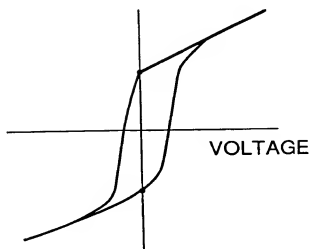


FIG. 105A

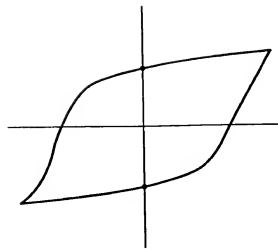


FIG. 105B

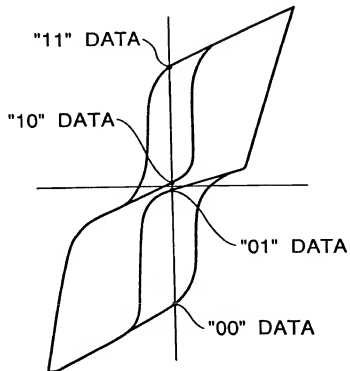


FIG. 105C

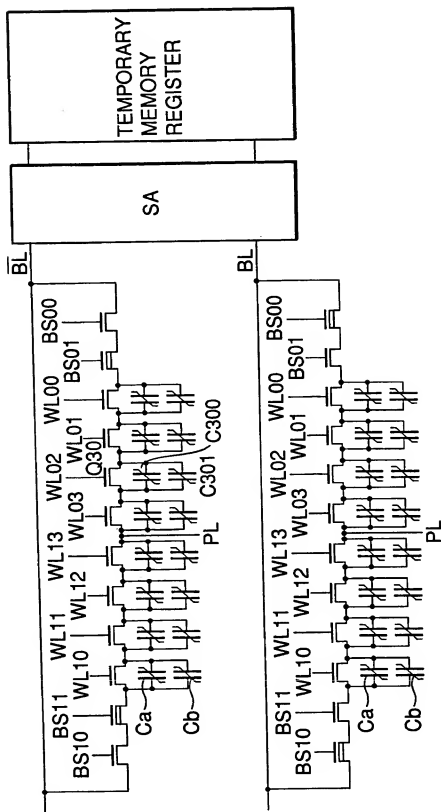


FIG. 106

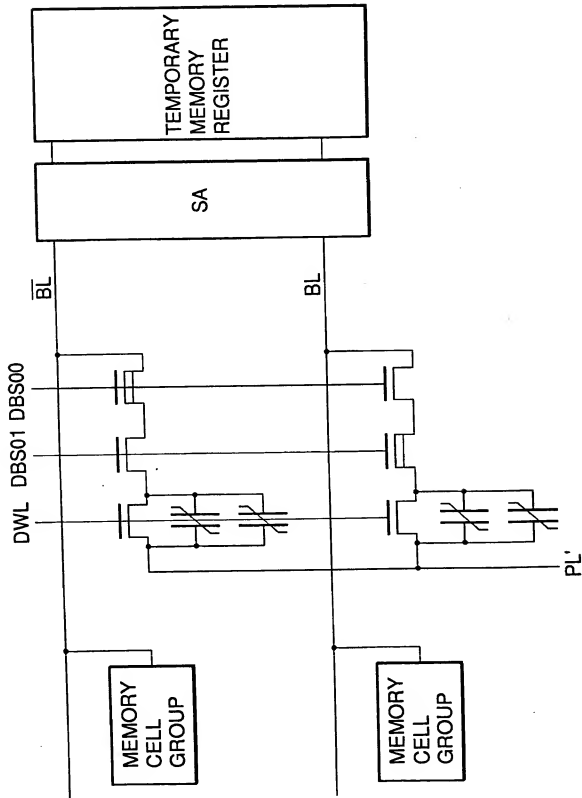


FIG.107

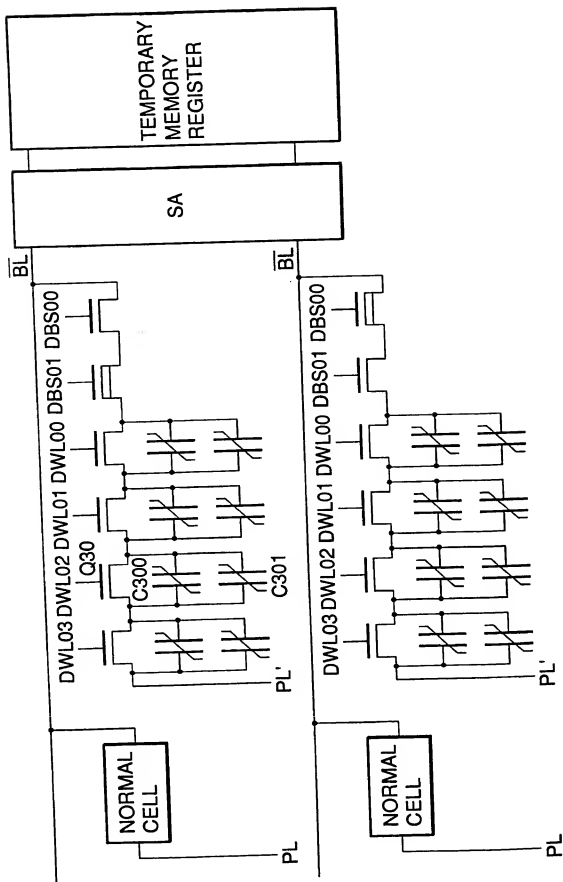


FIG. 108

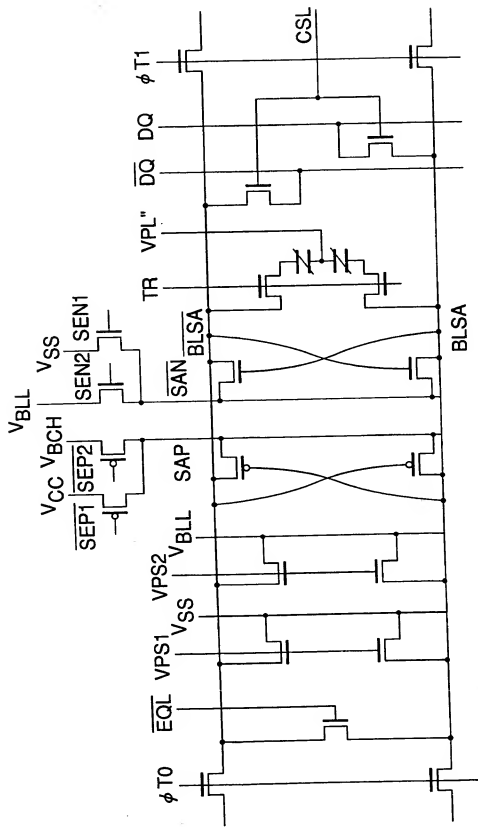


FIG. 109

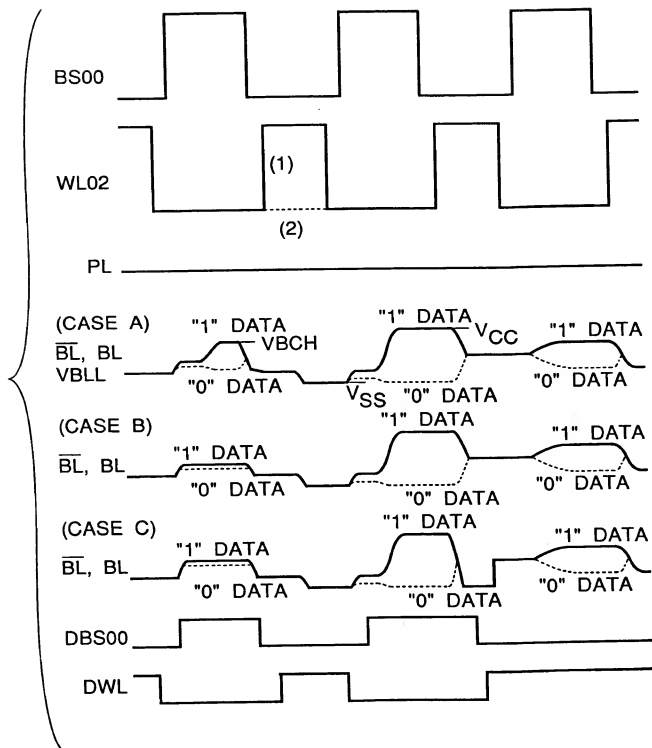


FIG. 110



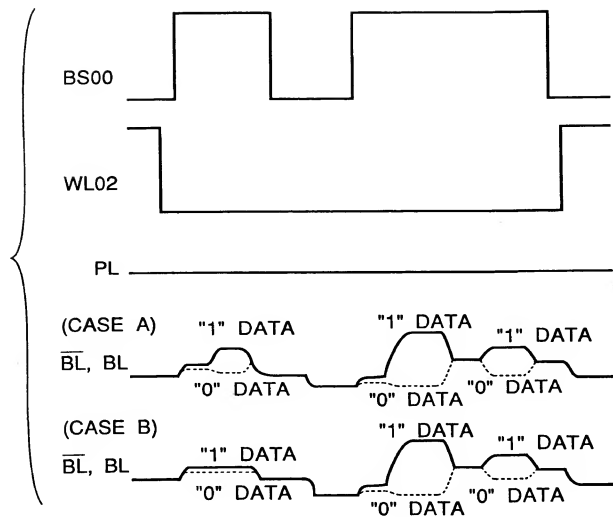


FIG.111

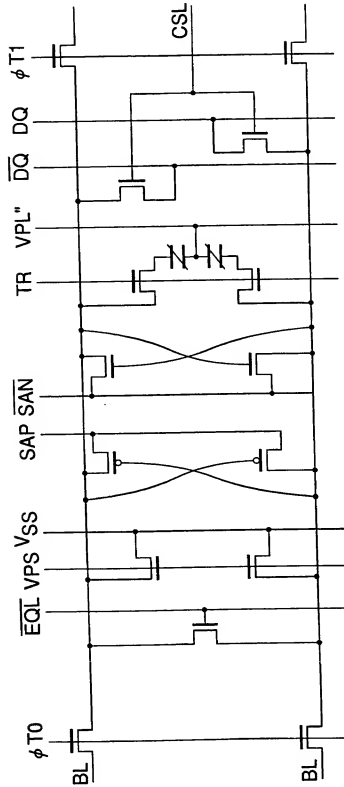


FIG. 112

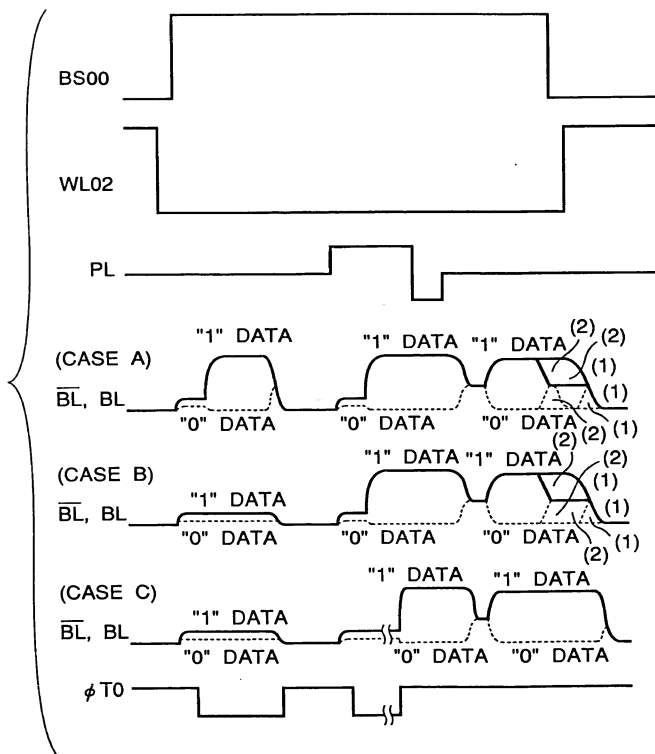
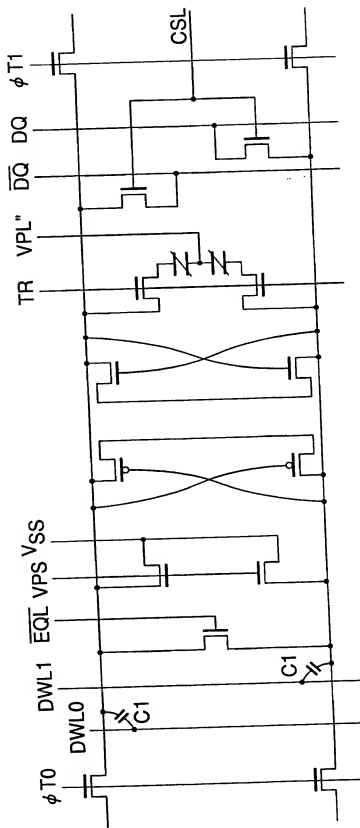


FIG. 113



**FIG. 114**

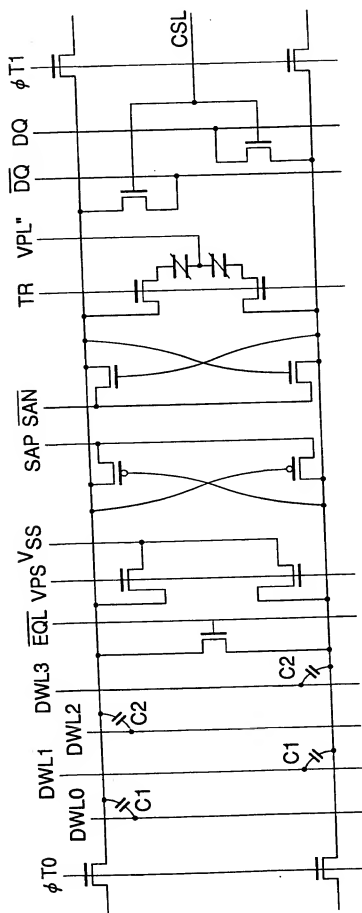


FIG. 115

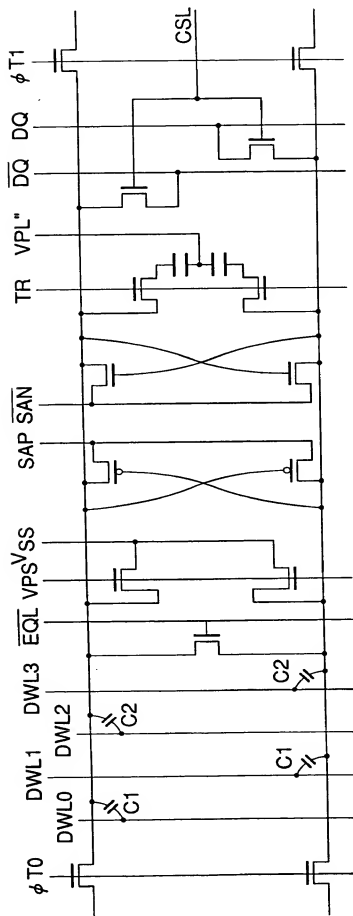


FIG. 116

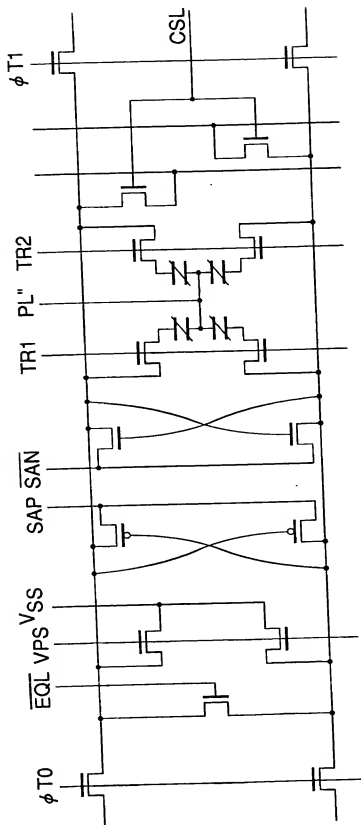


FIG. 117

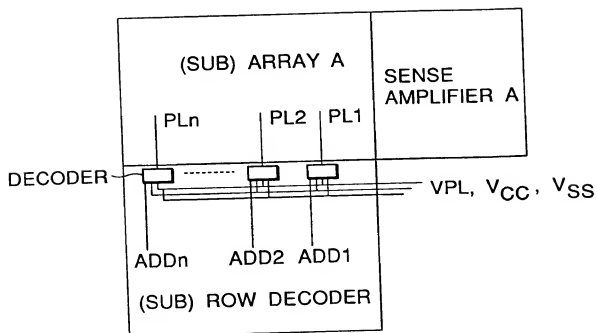


FIG.118



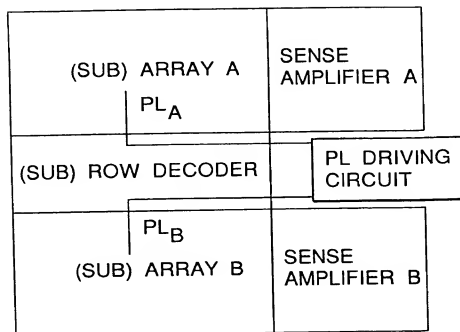


FIG. 119A

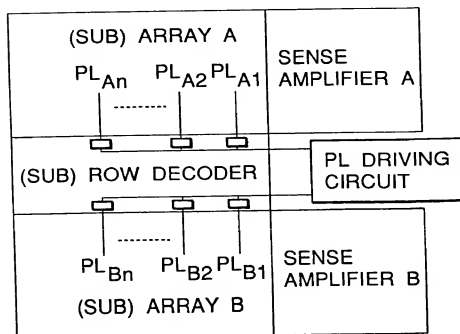


FIG. 119B

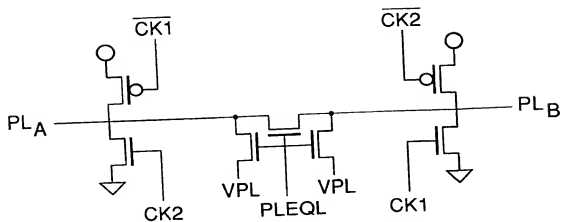


FIG. 120A

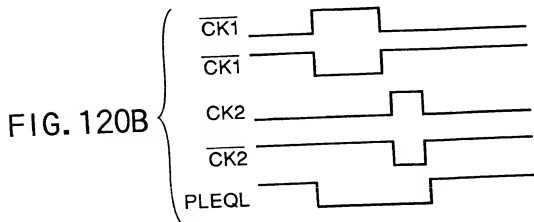


FIG. 120B

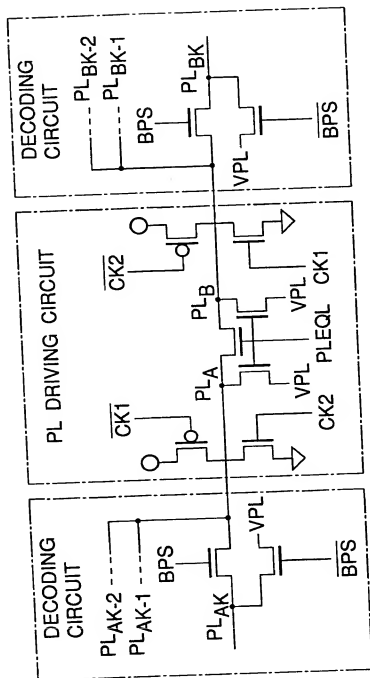
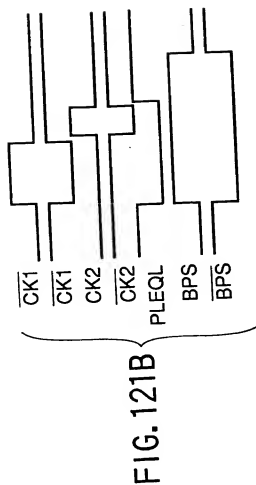


FIG. 121A



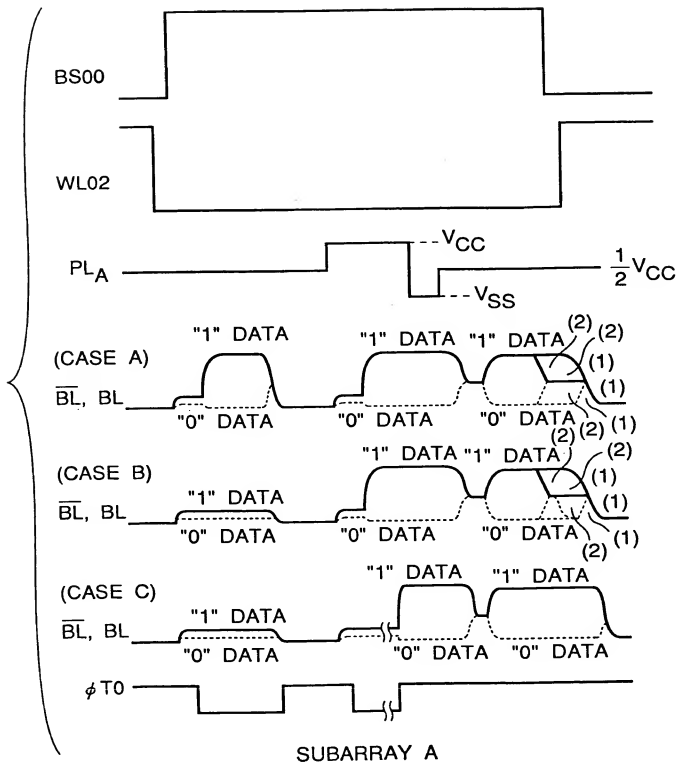
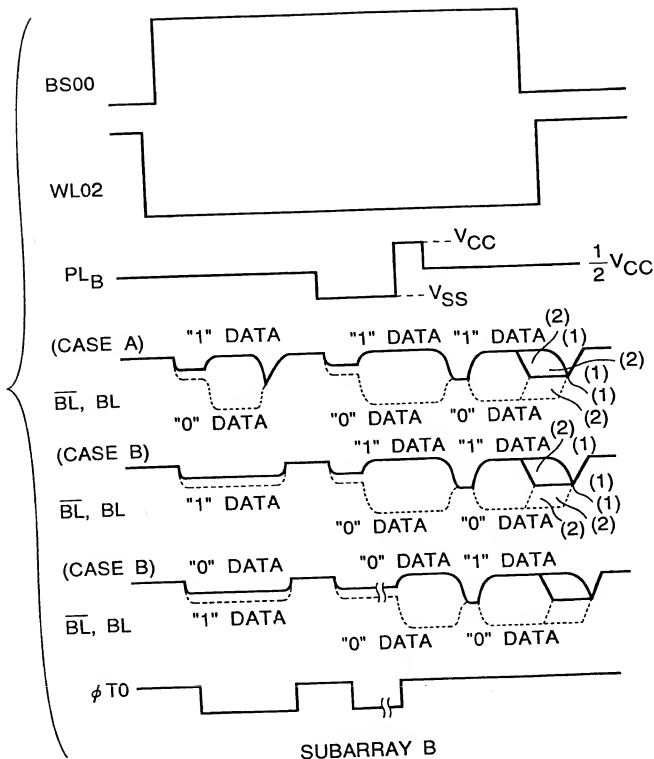


FIG.122A



SUBARRAY B

FIG. 122B

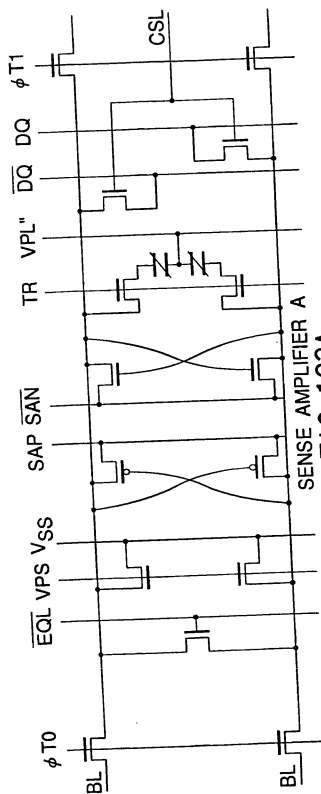


FIG. 123A

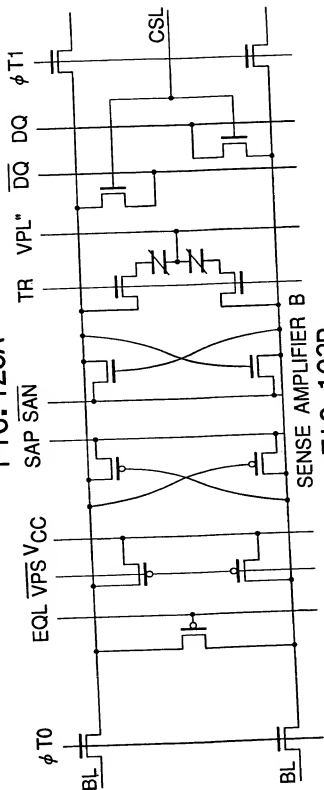
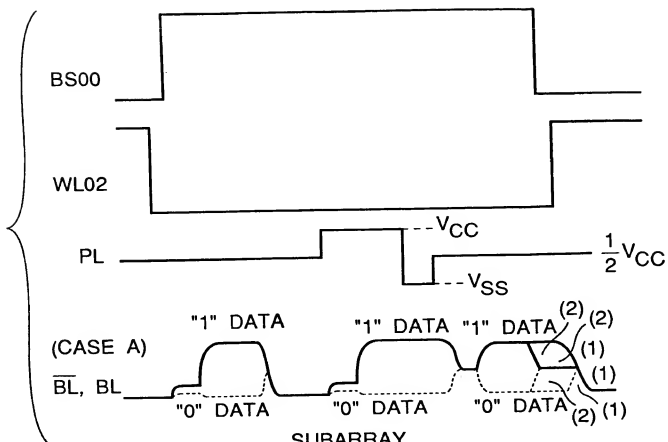
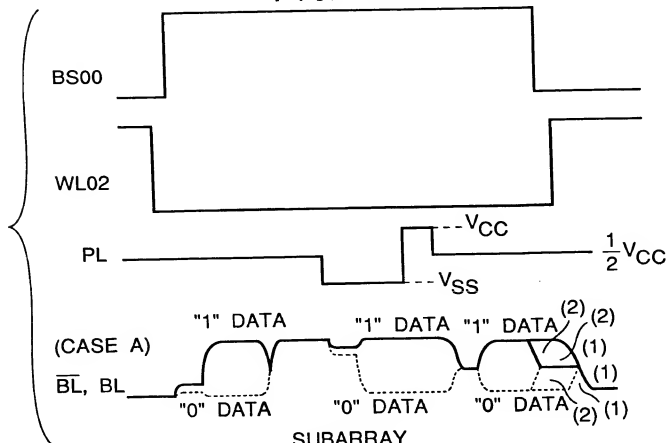


FIG. 123B



SUBARRAY  
**FIG. 124A**



SUBARRAY  
**FIG. 124B**

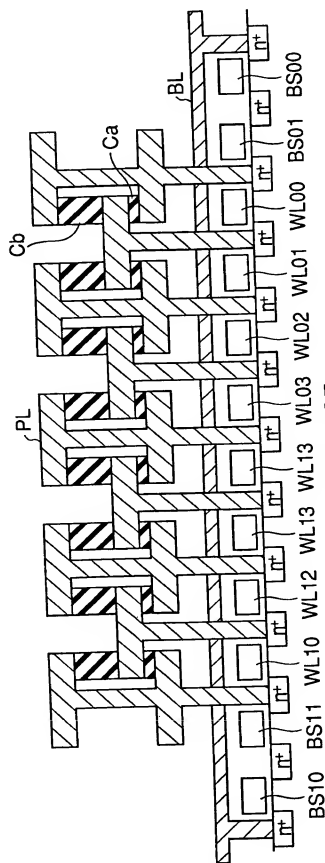


FIG. 125

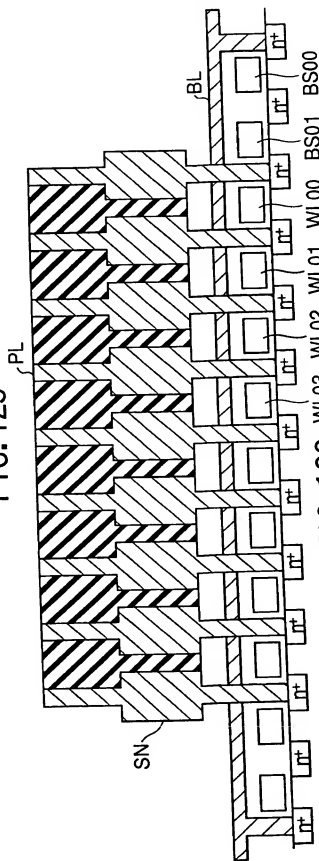


FIG. 126



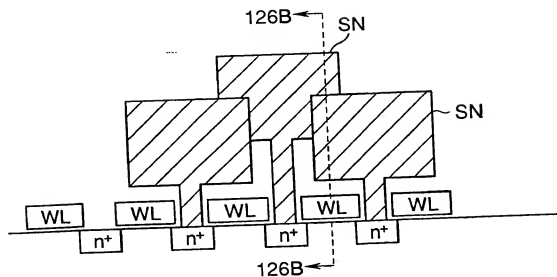
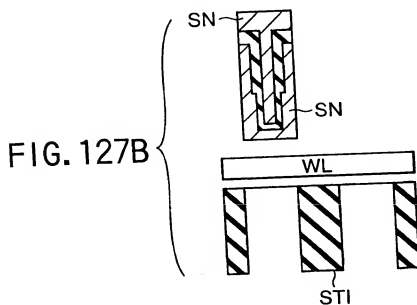


FIG. 127A



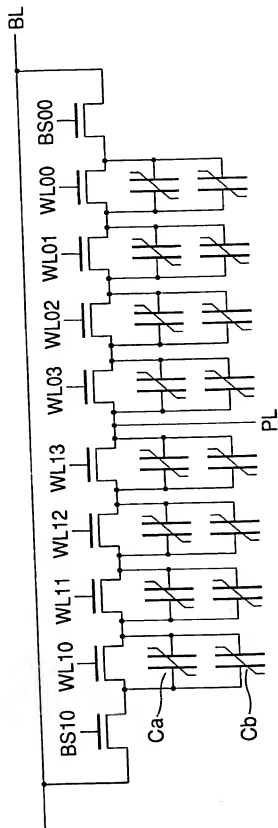


FIG. 128A

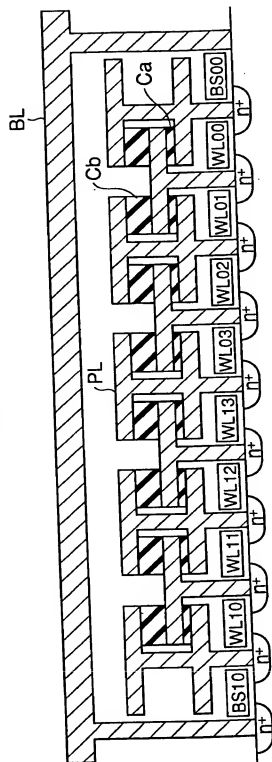


FIG. 128B

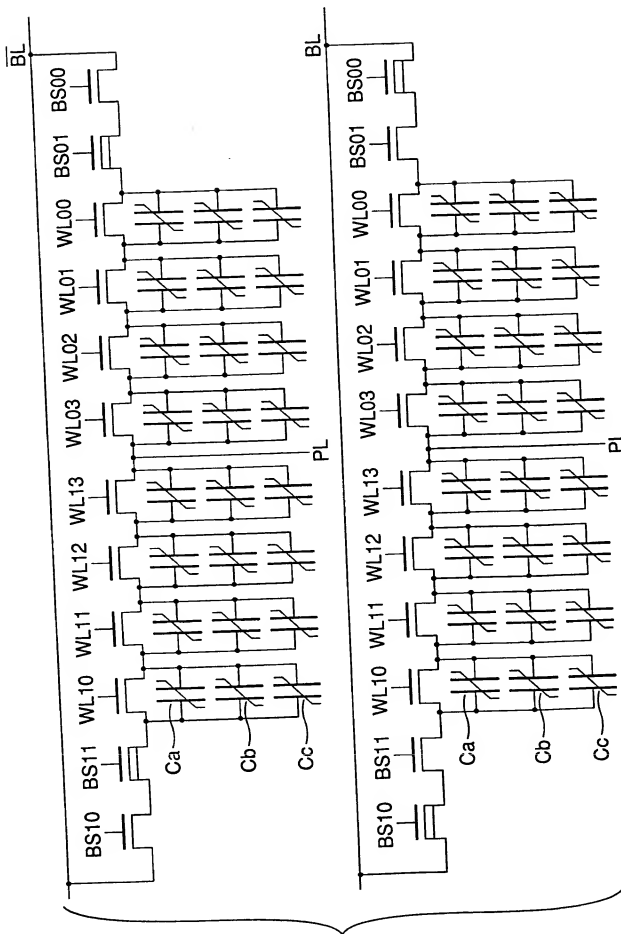


FIG. 129

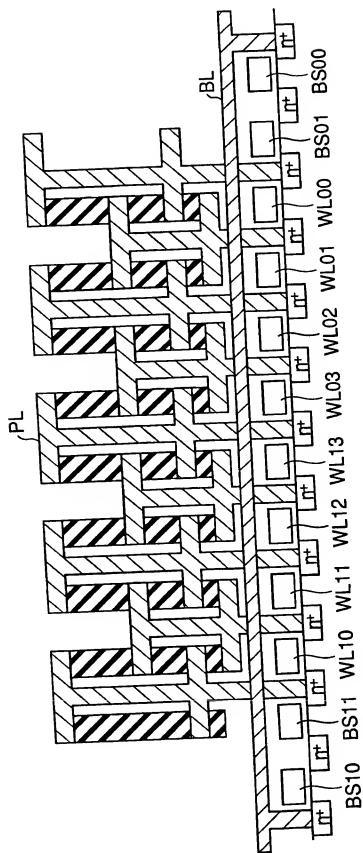


FIG. 130

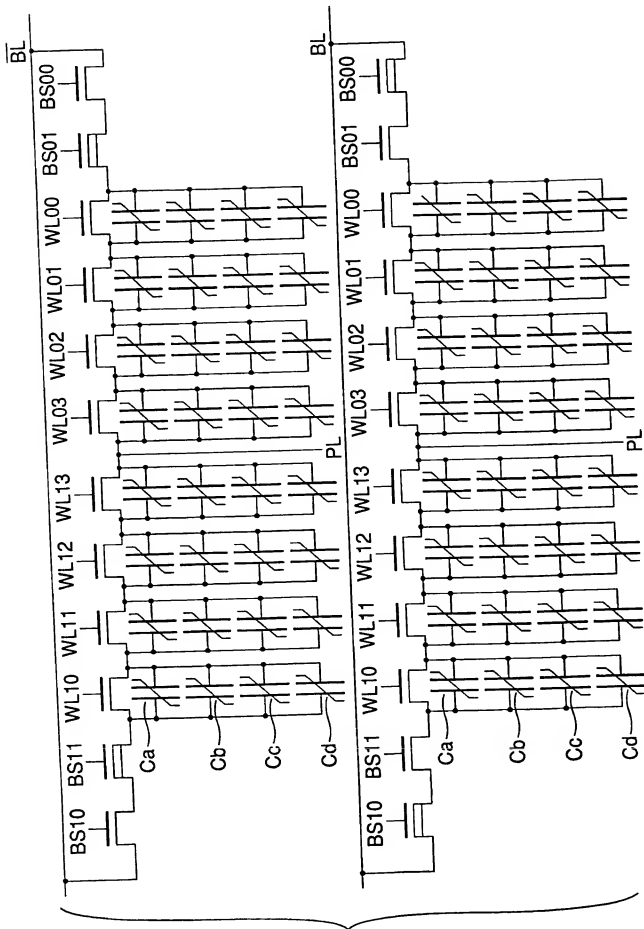


FIG. 131

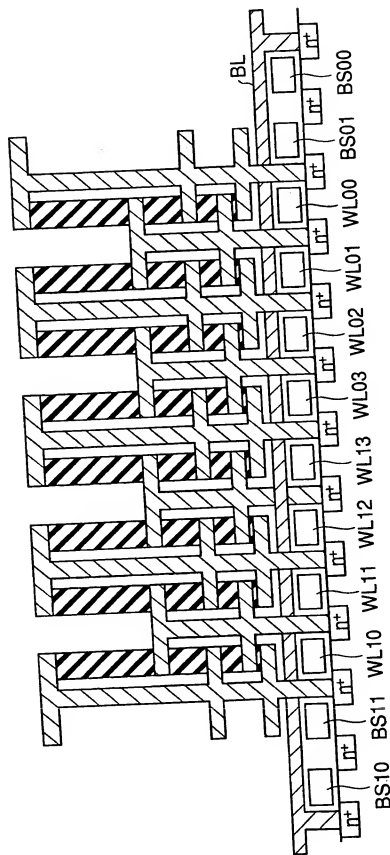


FIG.132

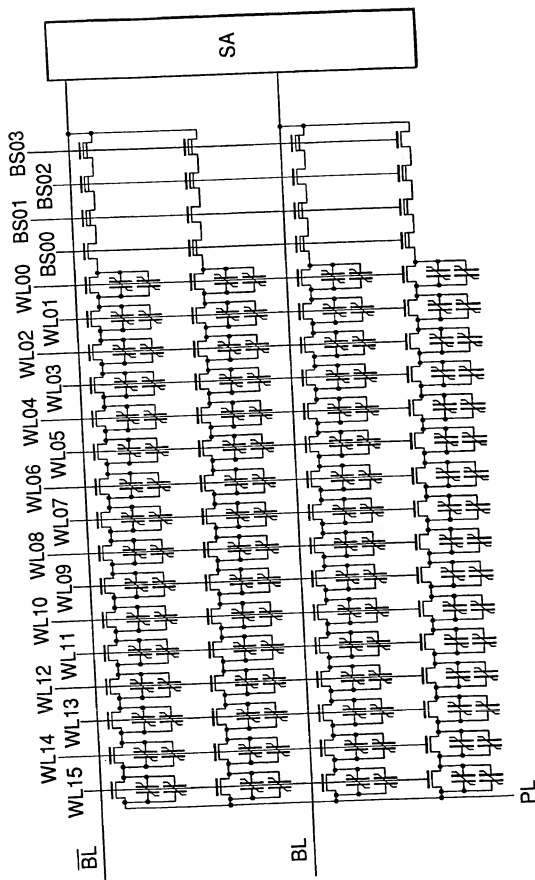


FIG. 133

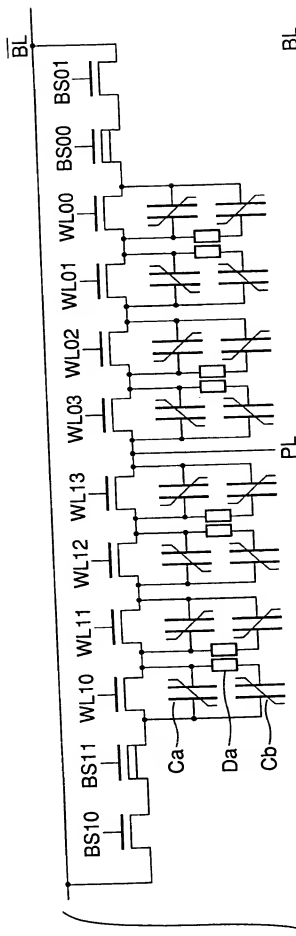


FIG. 134A

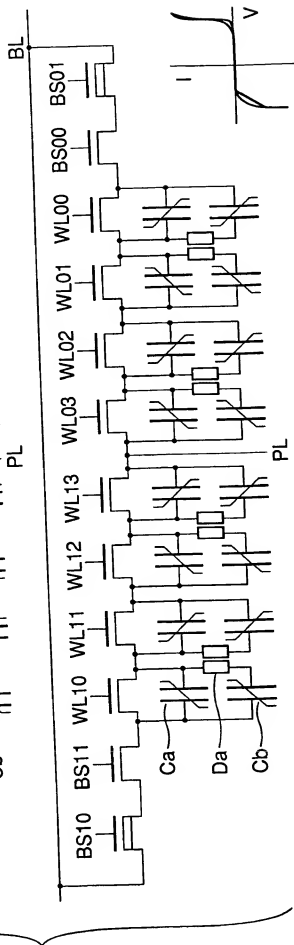


FIG. 134B





FIG. 135E

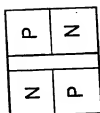


FIG. 135D



FIG. 135C



FIG. 135B

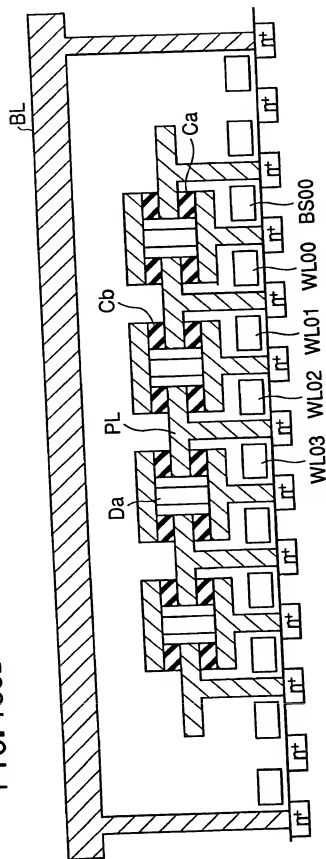


FIG. 135A

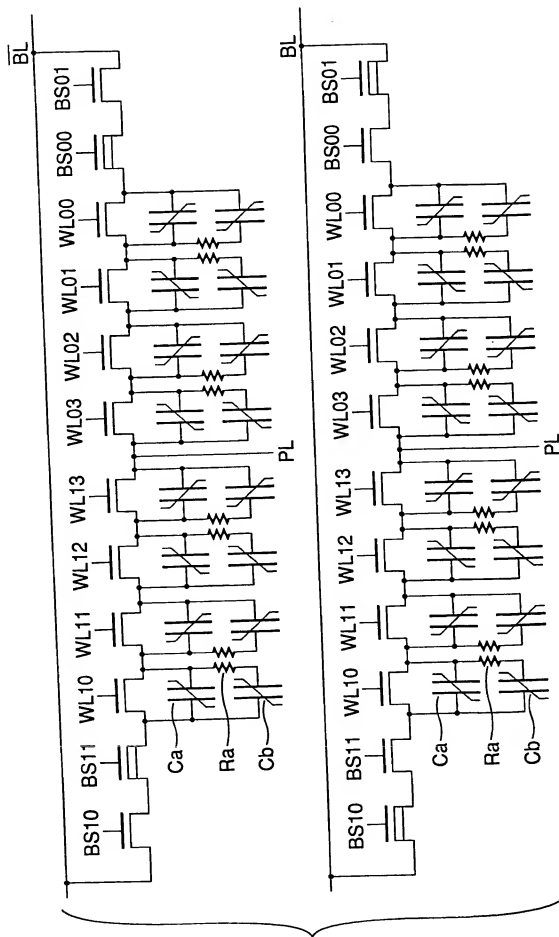


FIG. 136

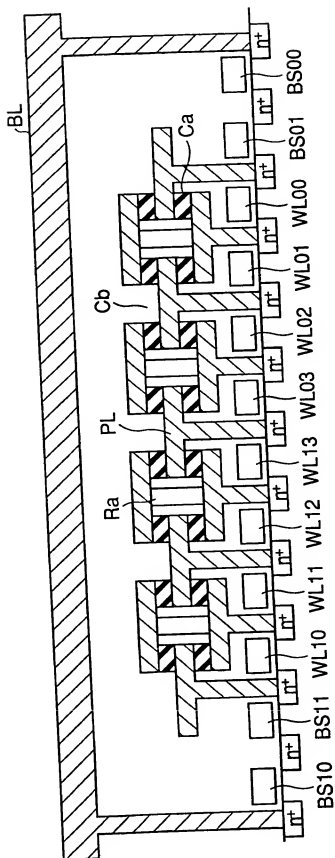


FIG. 137

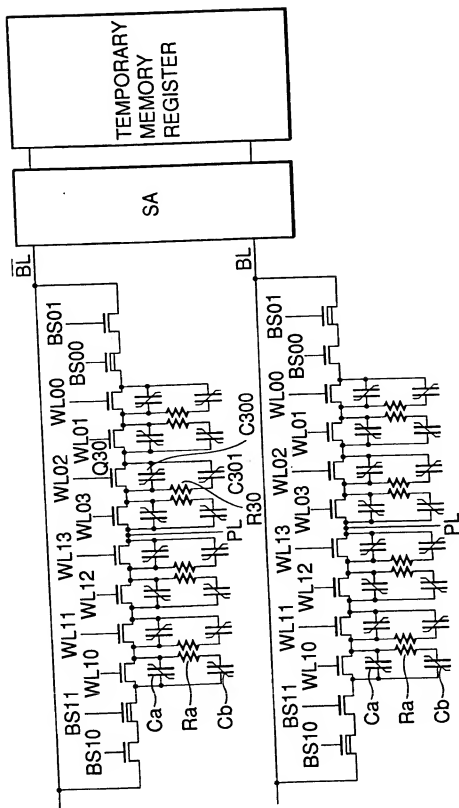


FIG. 138

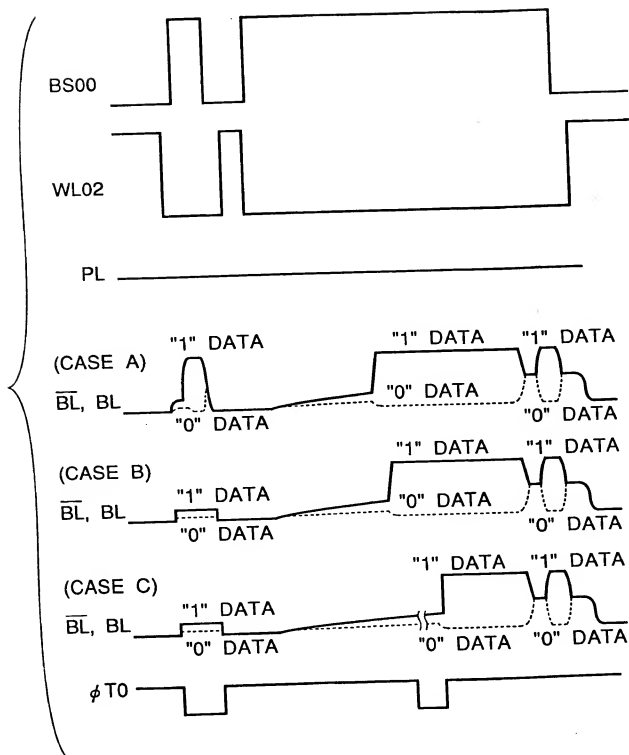


FIG. 139

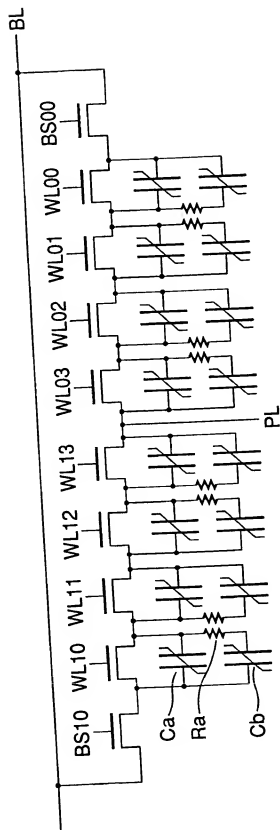


FIG. 140A

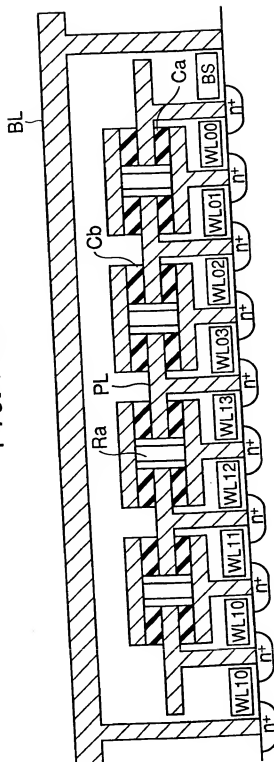


FIG. 140B

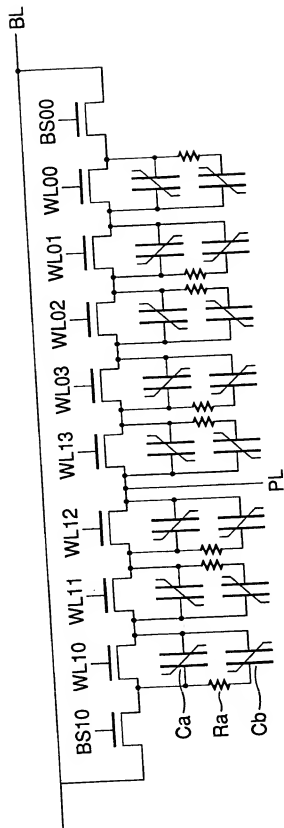


FIG. 141A

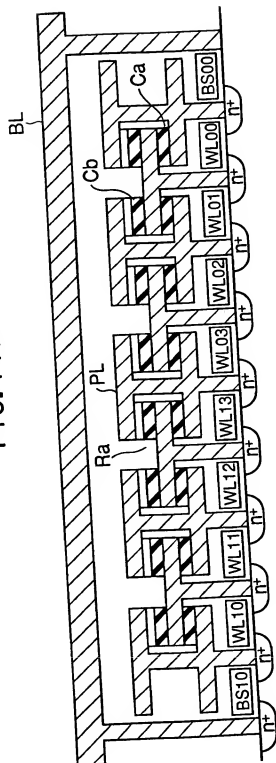


FIG. 141B

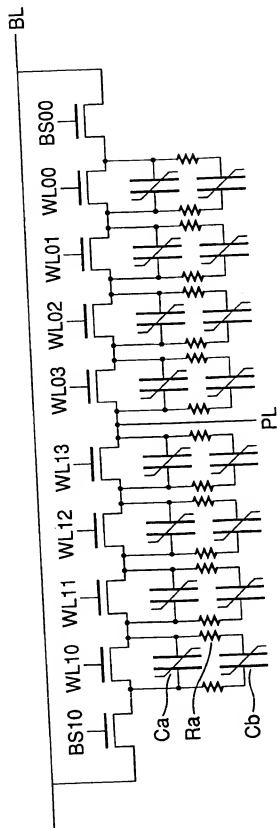


FIG. 142A

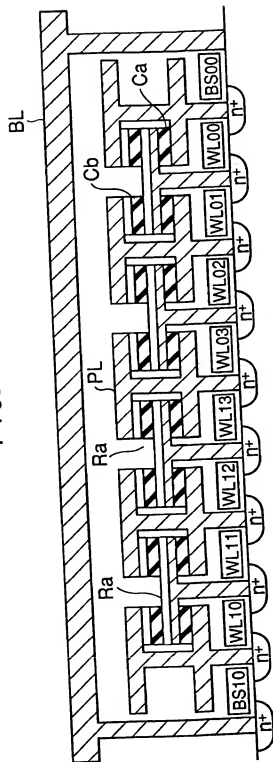


FIG. 142B



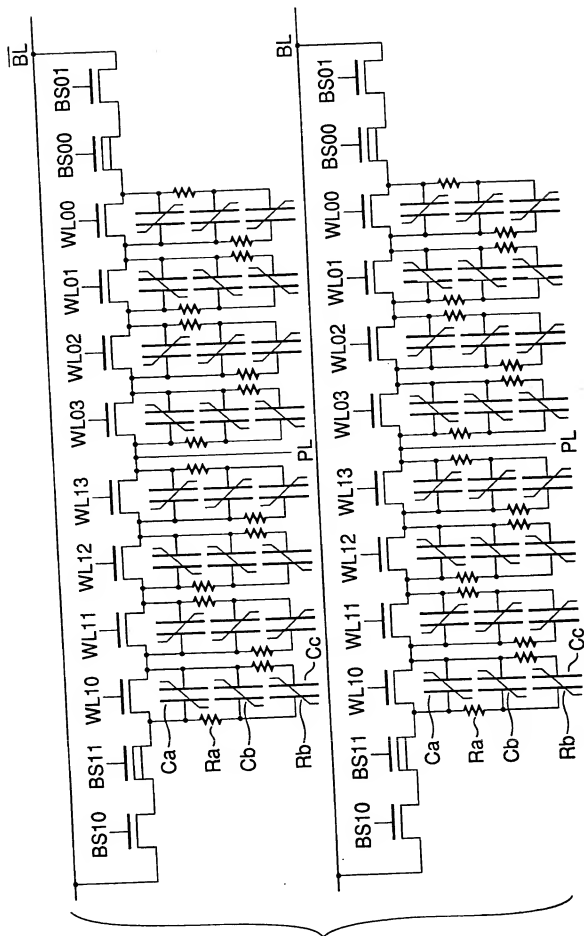


FIG. 143

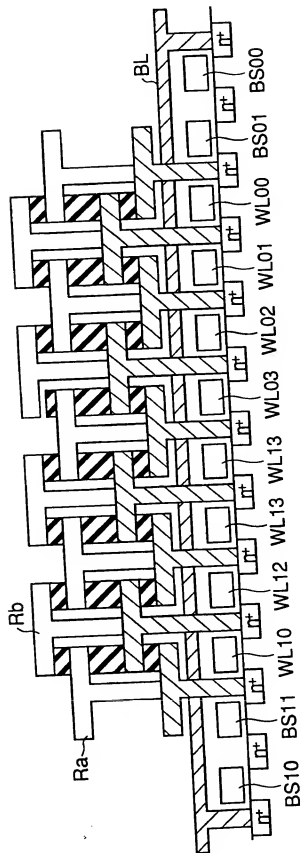


FIG. 144

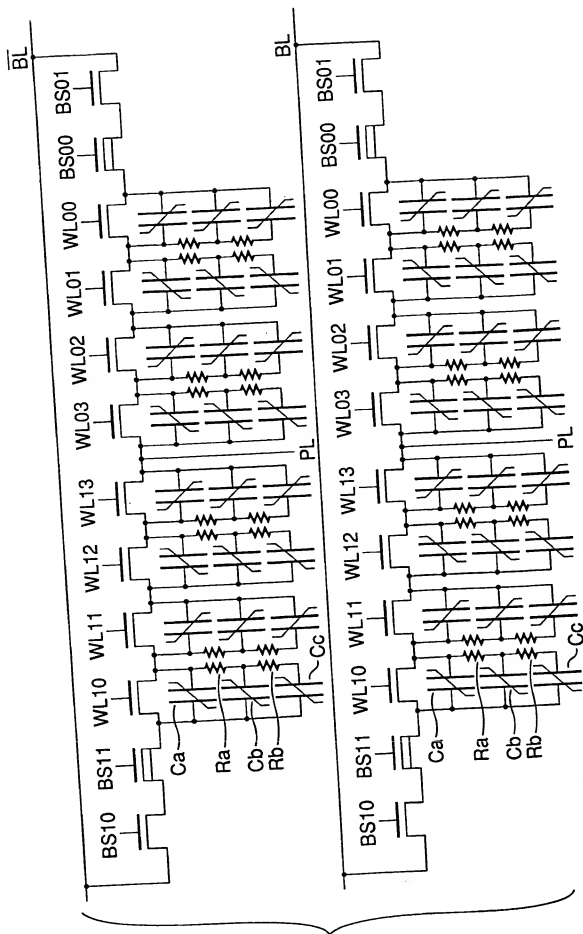


FIG. 145

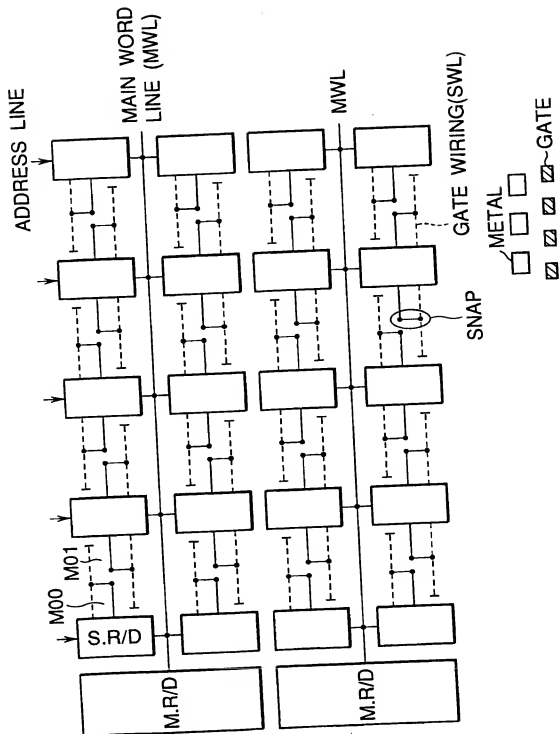


FIG. 146

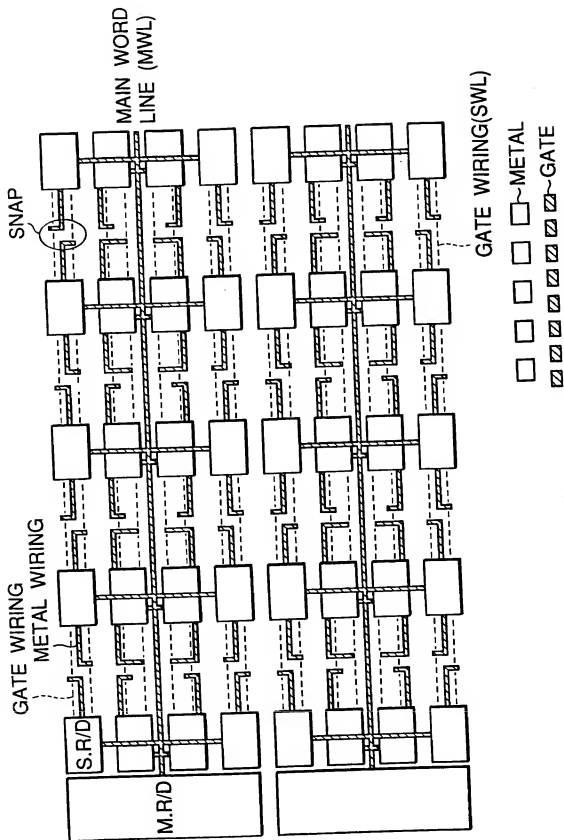


FIG. 147

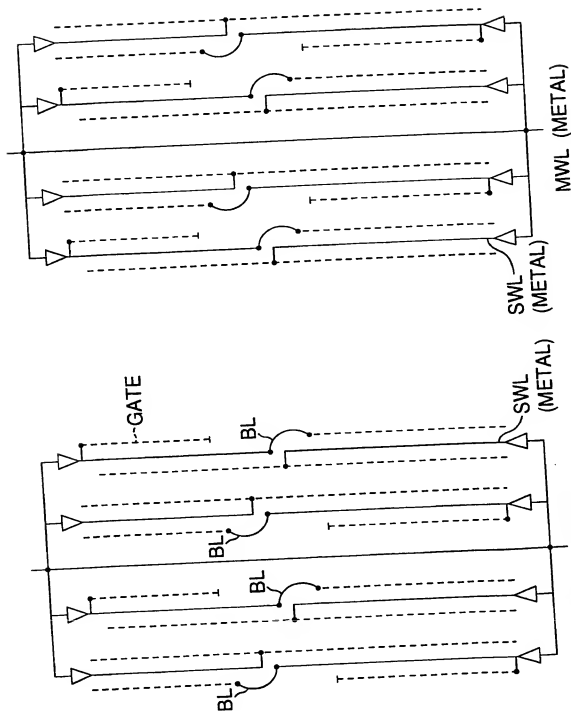


FIG. 148B

FIG. 148A

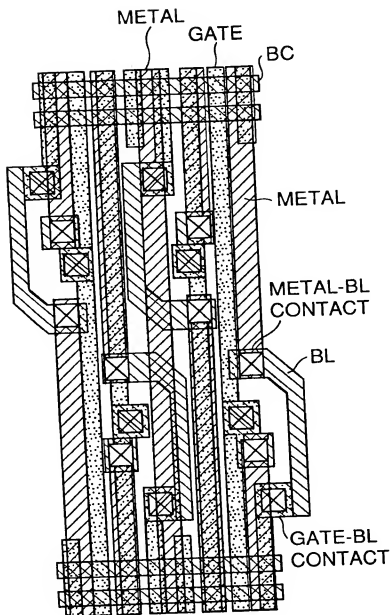


FIG. 149A

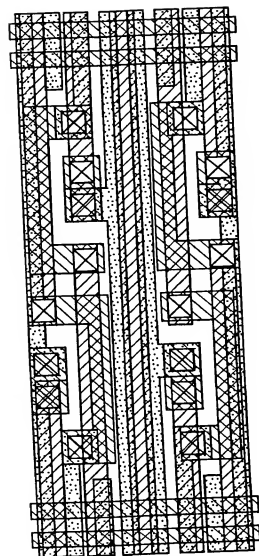


FIG. 149B

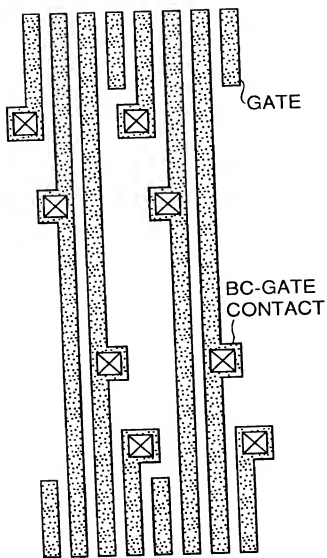


FIG. 150A

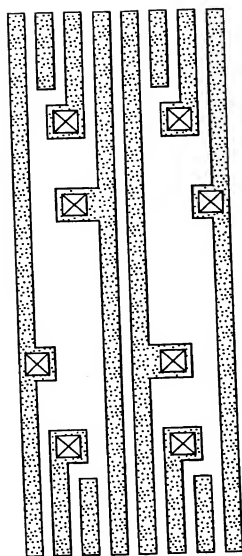


FIG. 150B



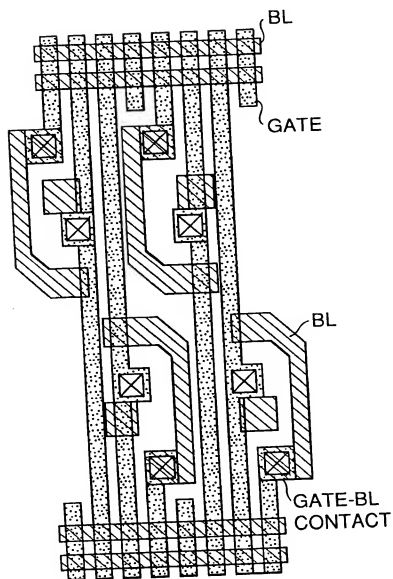


FIG. 151A

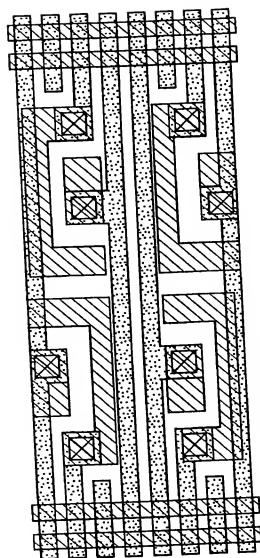


FIG. 151B

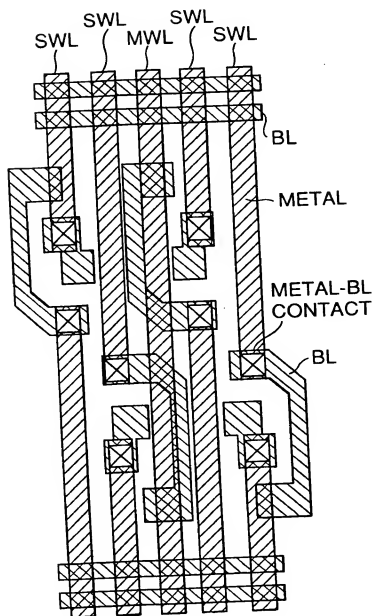


FIG. 152A

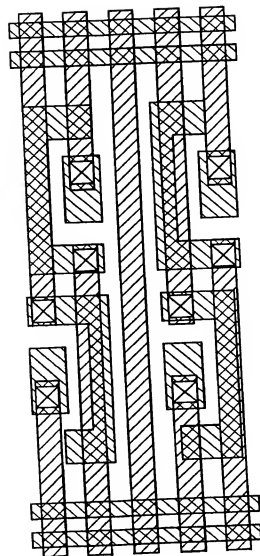


FIG. 152B

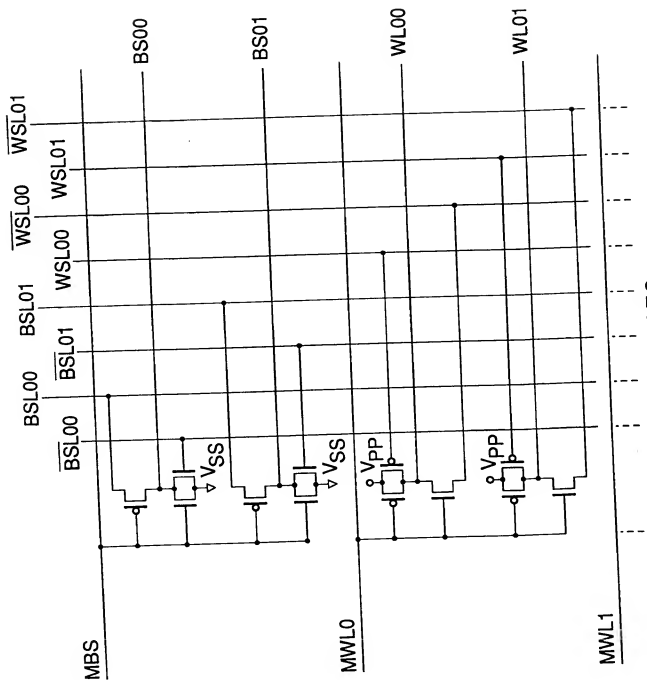


FIG. 153

**FIG. 154**

**FIG. 154**

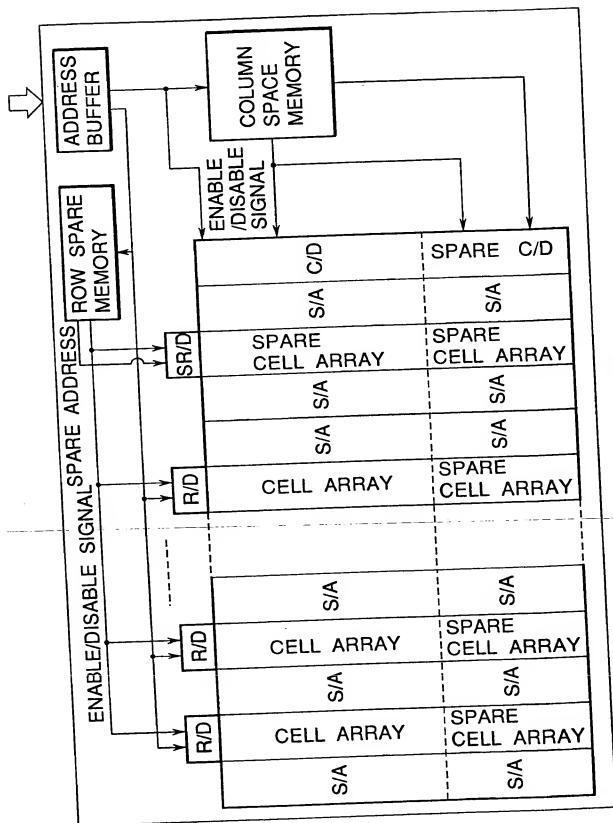


FIG. 155

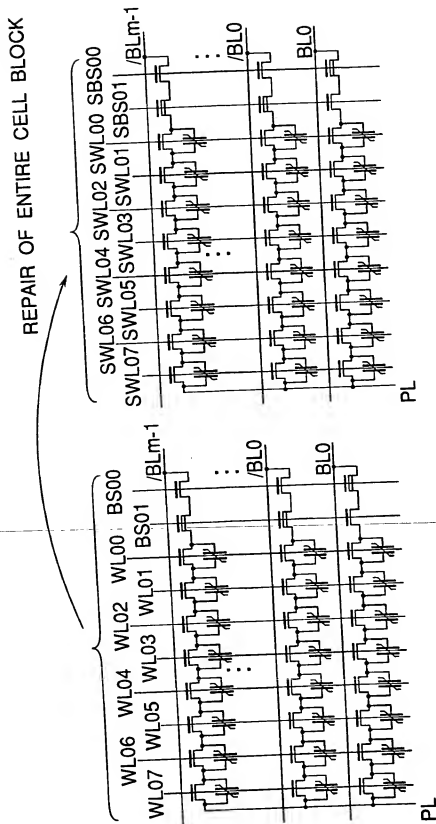


FIG. 156

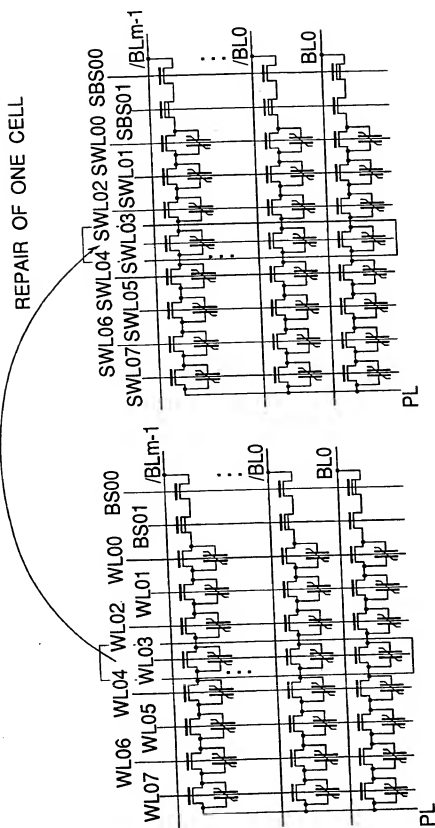


FIG. 157

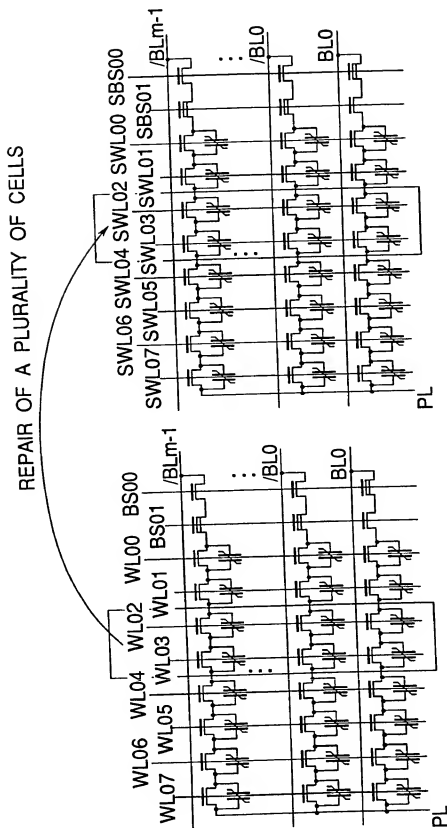


FIG.158



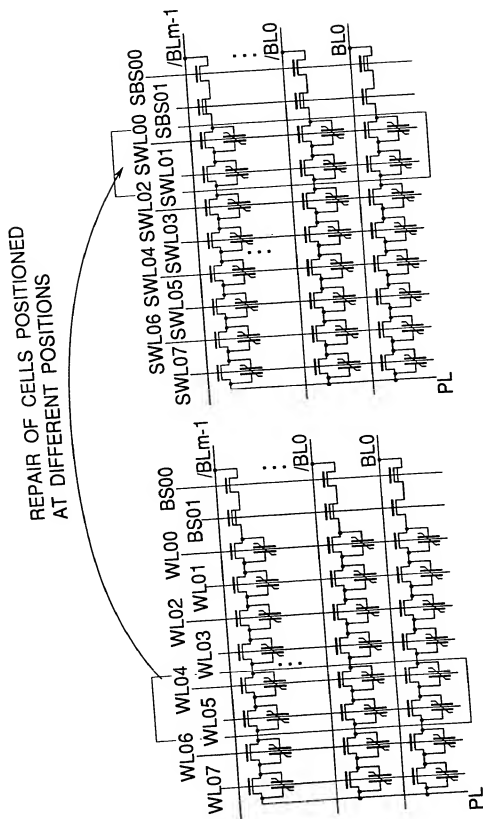


FIG. 159

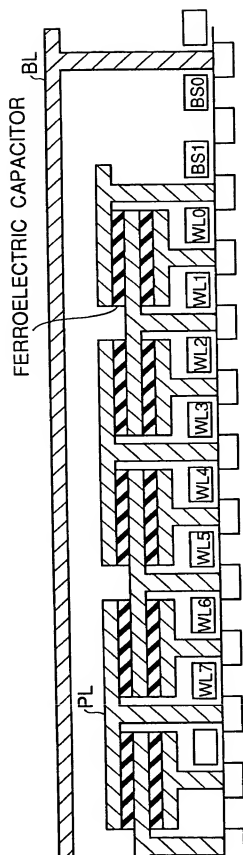


FIG. 160

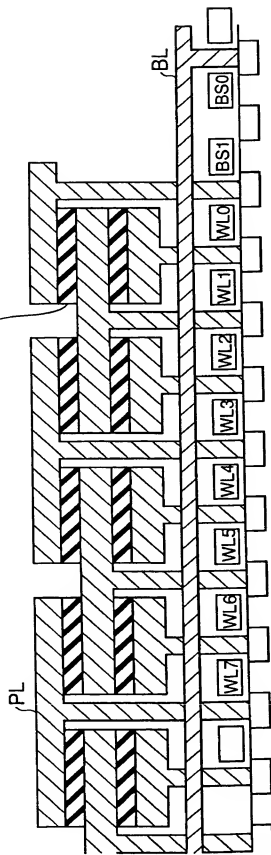


FIG. 161

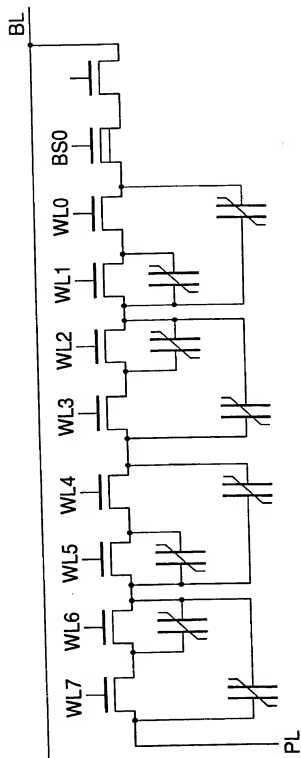


FIG. 162

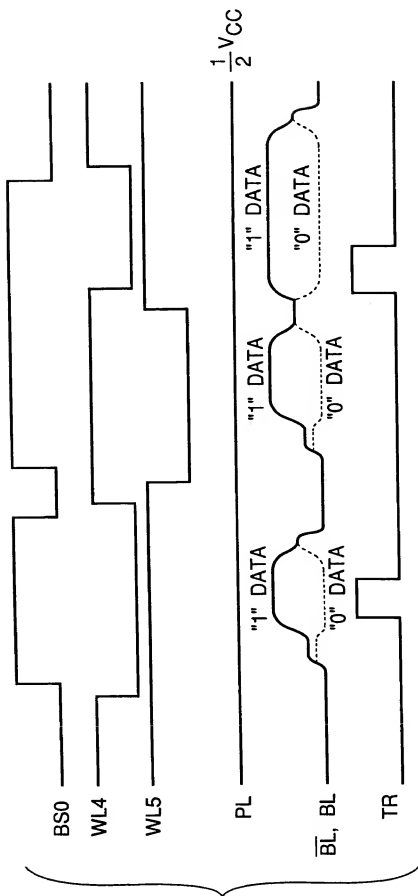


FIG. 163

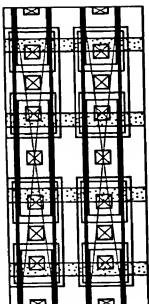


FIG. 164C

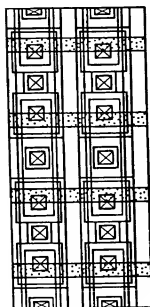


FIG. 164D

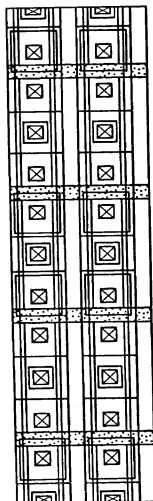


FIG. 164B

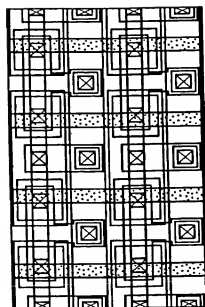


FIG. 164A

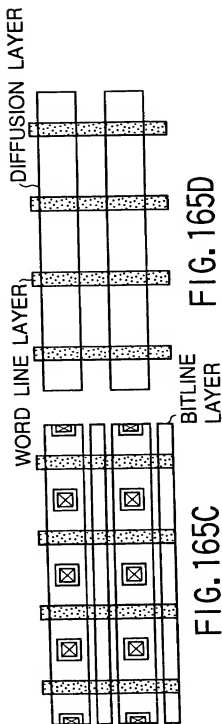


FIG. 165C

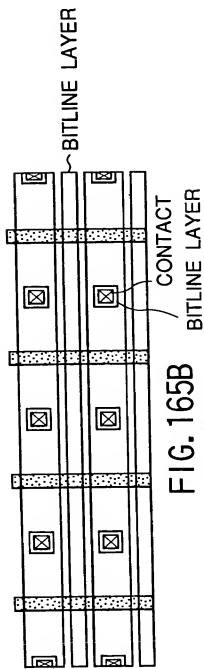


FIG. 165D

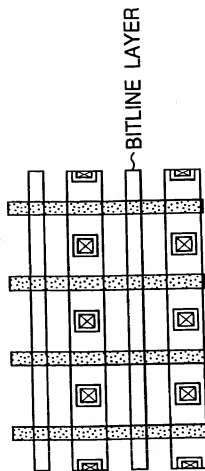
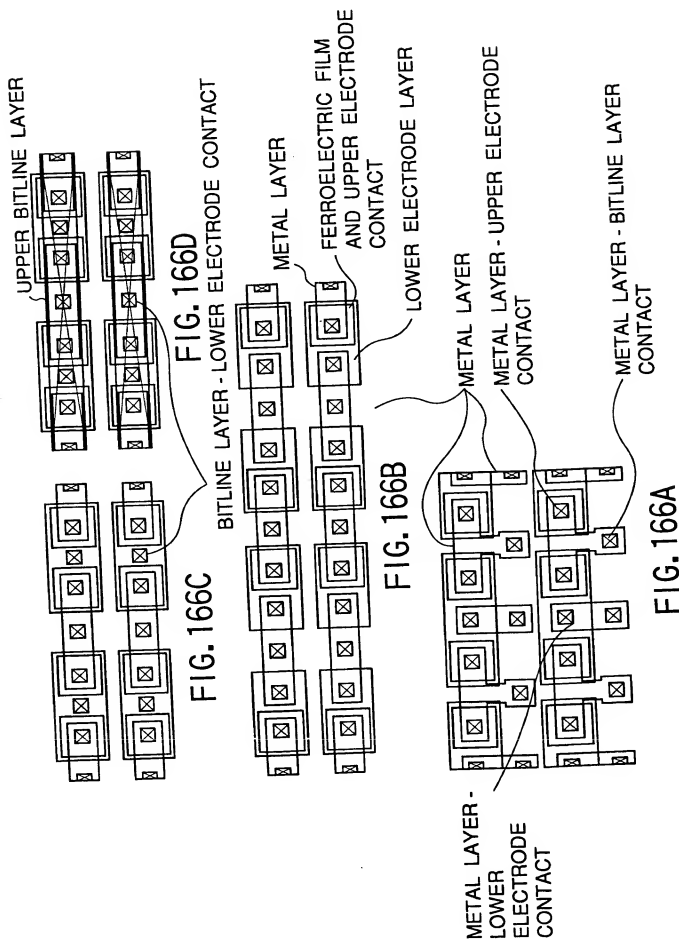
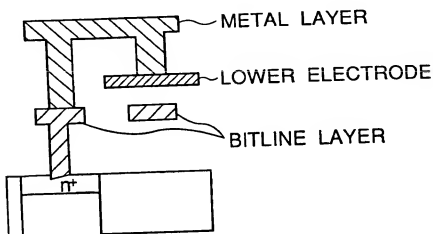
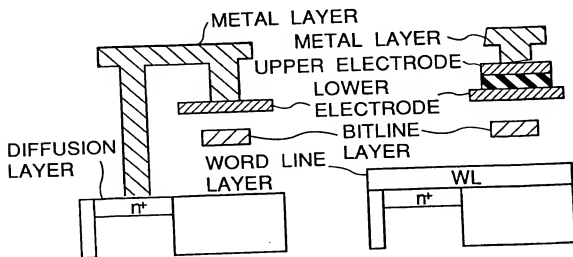
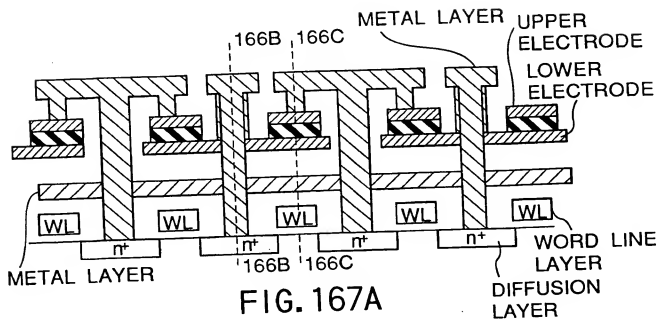


FIG. 165A







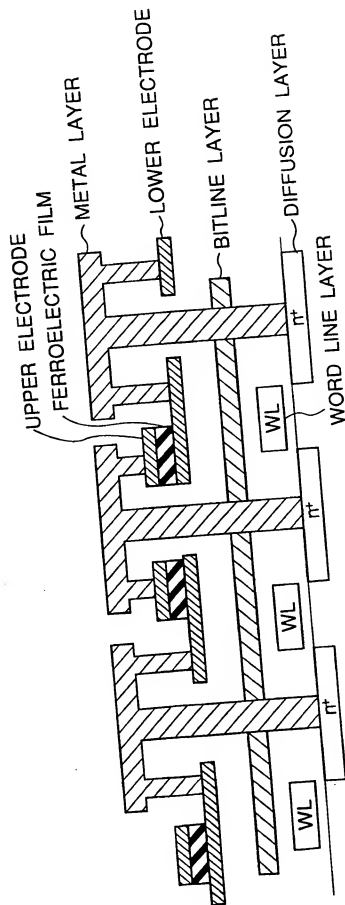


FIG. 168

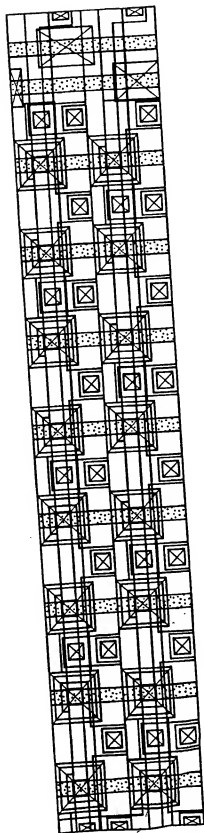


FIG. 169A

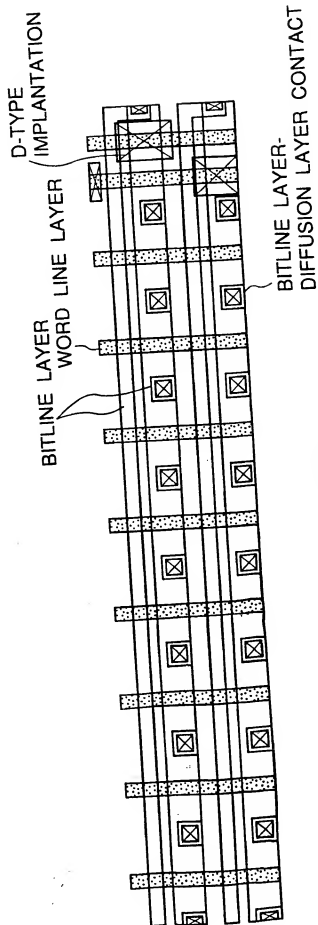


FIG. 169B

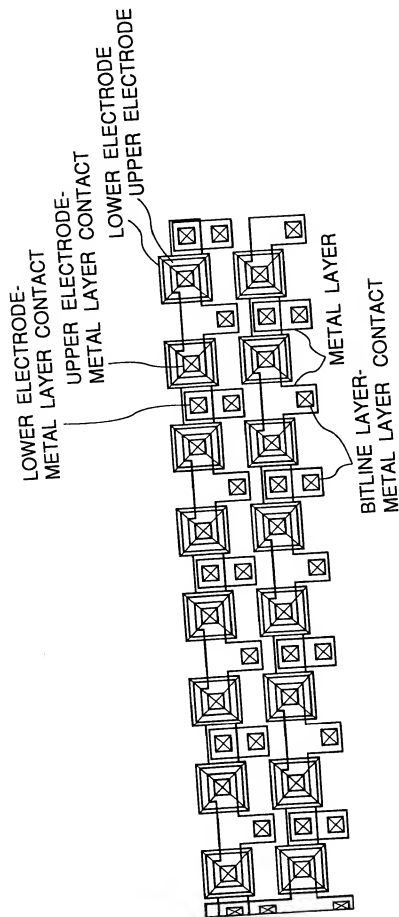


FIG. 169C

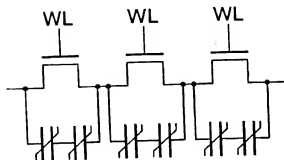


FIG. 170A

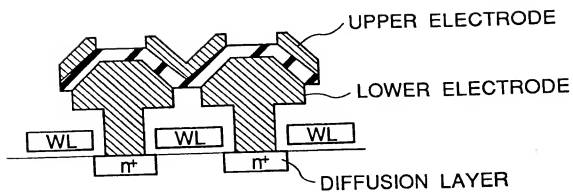


FIG. 170B

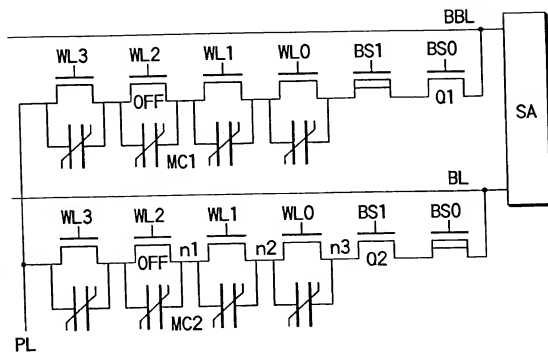
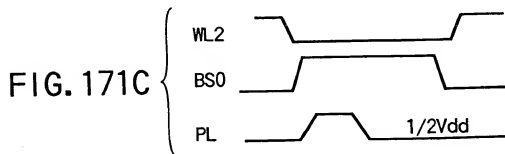
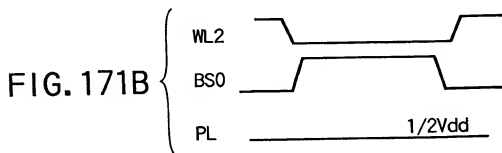


FIG. 171A



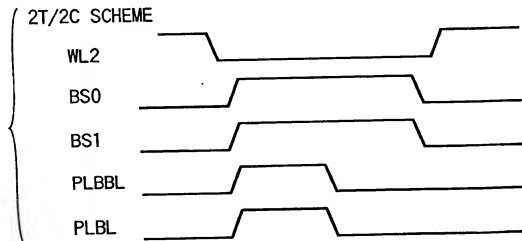
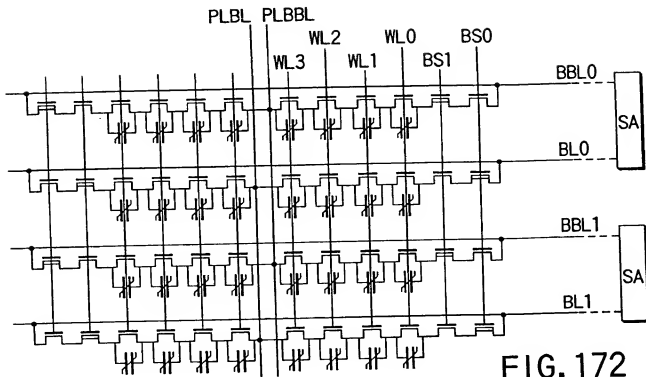


FIG. 173A

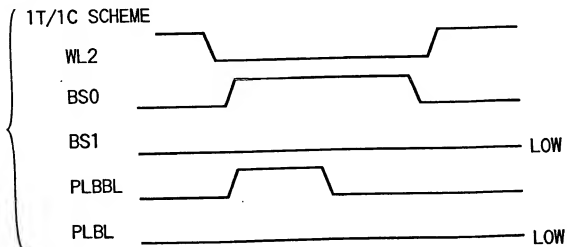


FIG. 173B

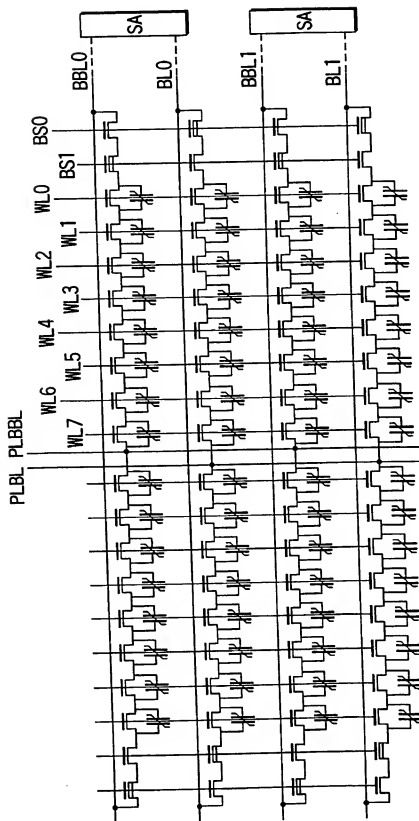


FIG. 174

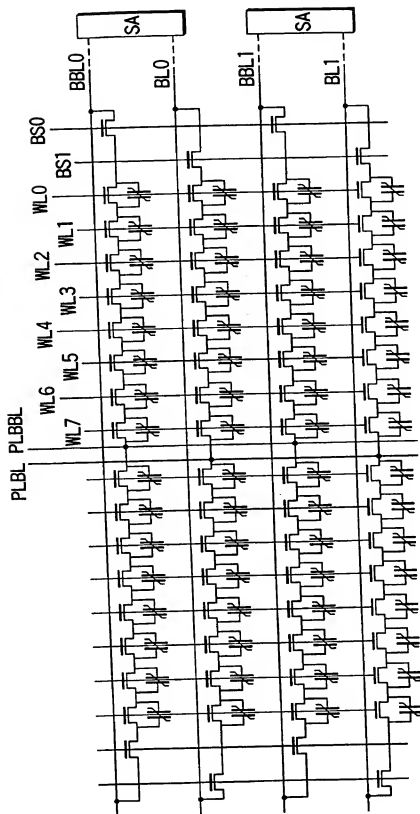


FIG. 175



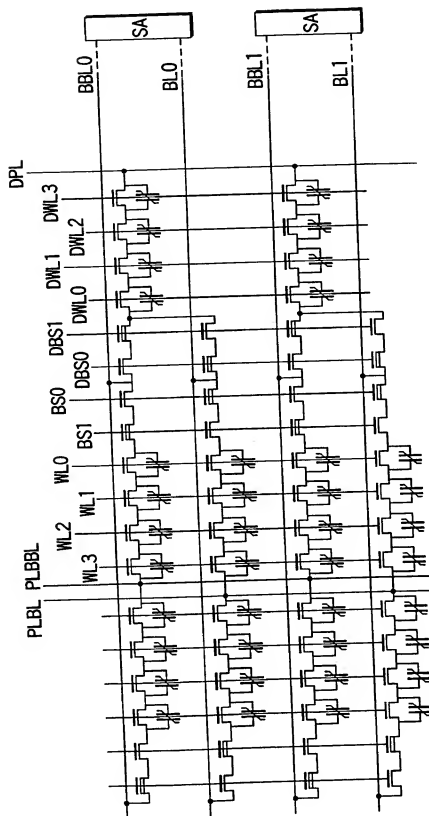


FIG. 176

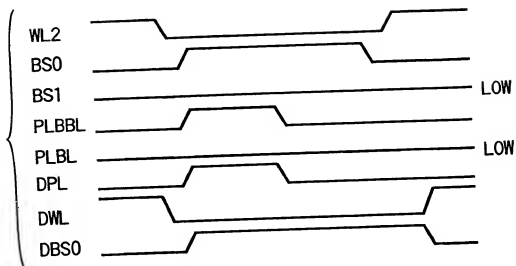


FIG. 177A

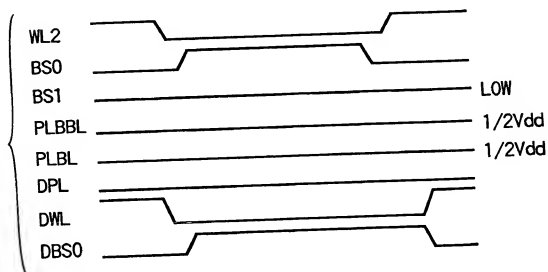
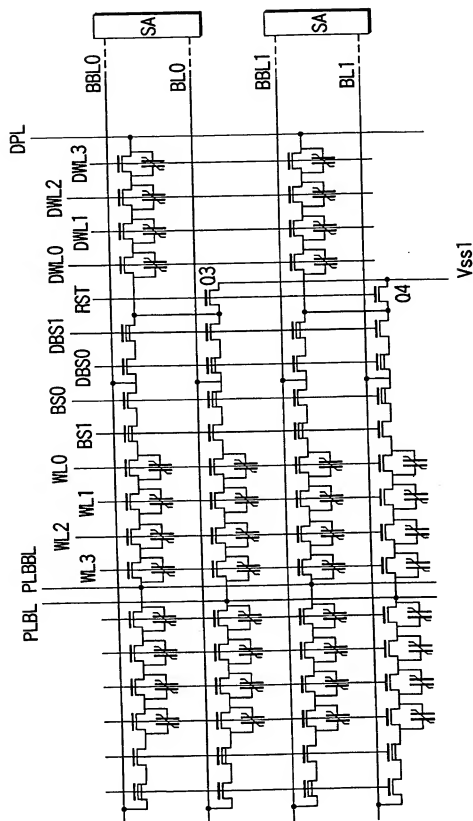


FIG. 177B



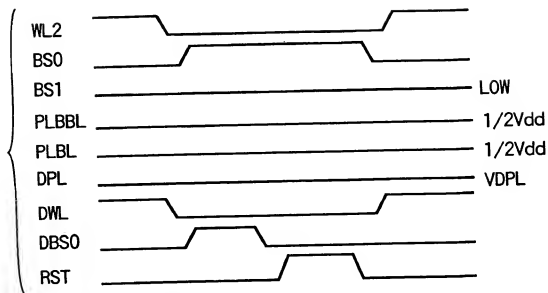


FIG. 179A

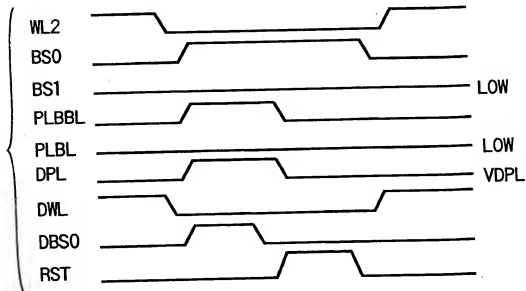


FIG. 179B

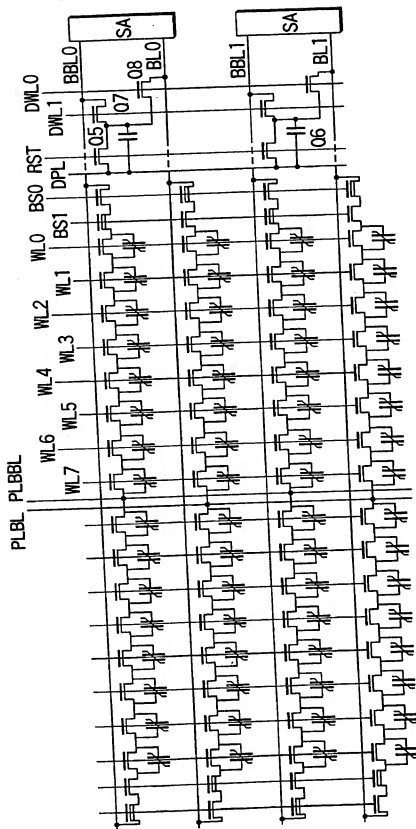


FIG. 180

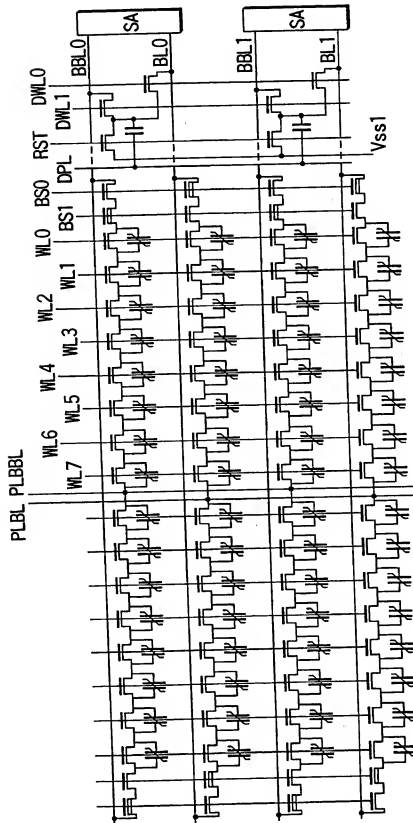


FIG. 181

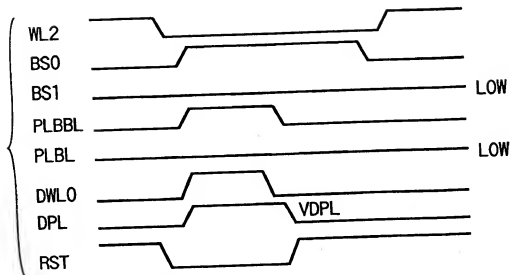


FIG. 182A

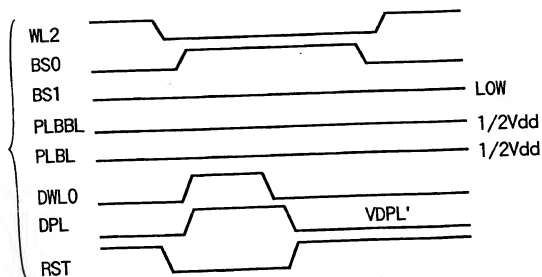


FIG. 182B

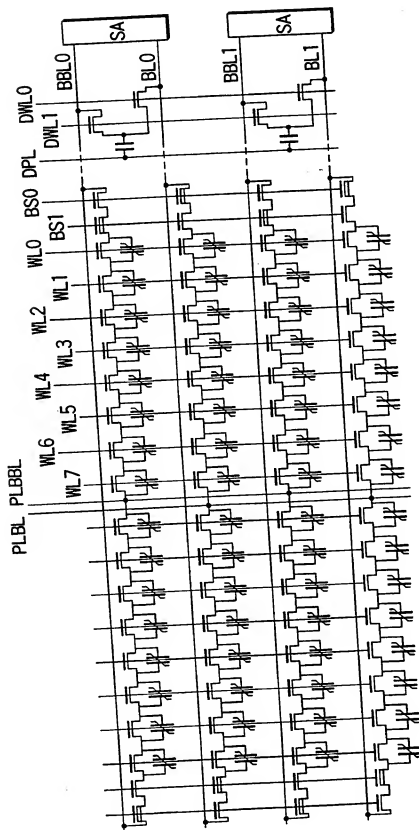


FIG. 183



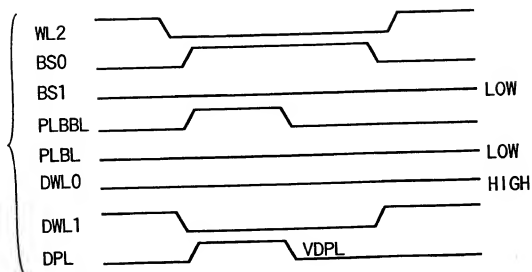


FIG. 184A

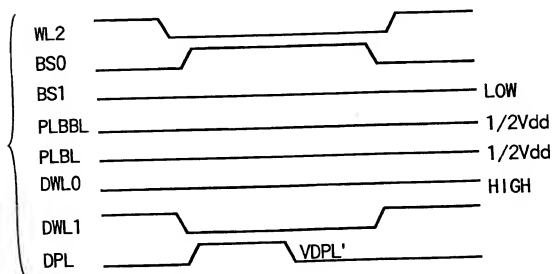


FIG. 184B

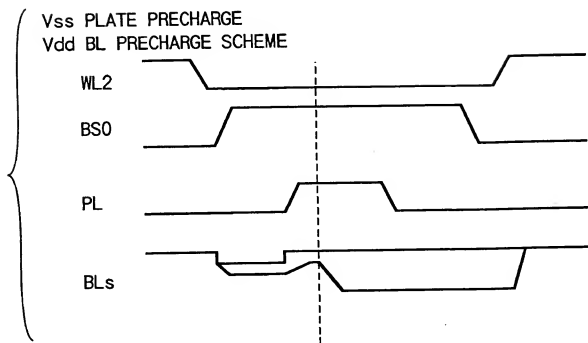


FIG. 185A

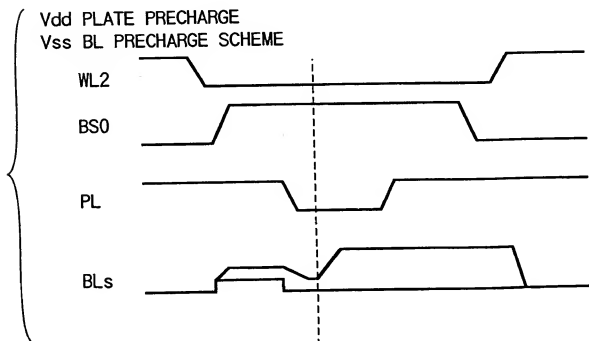


FIG. 185B

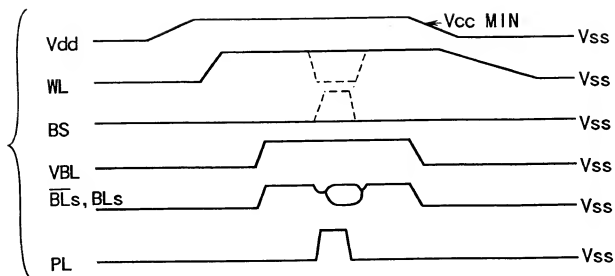


FIG. 186A

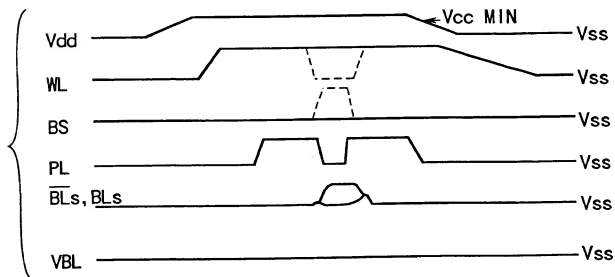


FIG. 186B

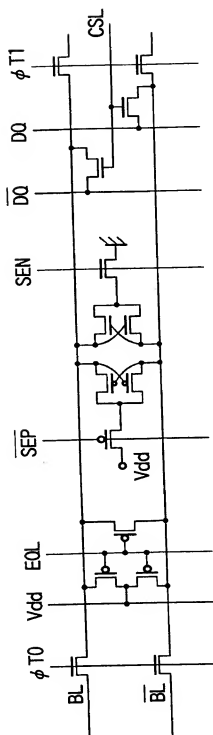


FIG. 187

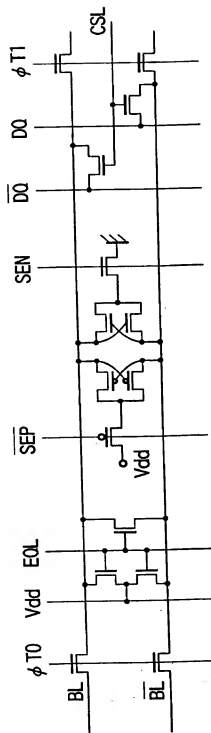
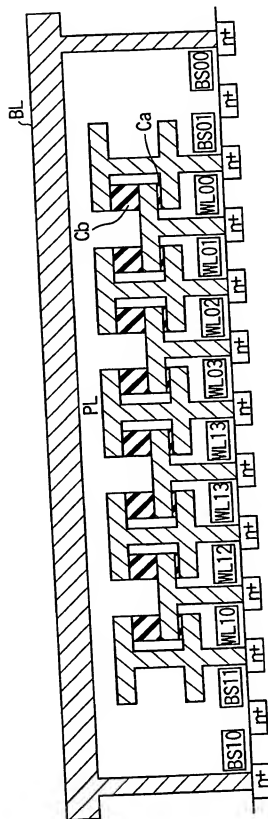


FIG. 188



THICKNESS OF Cb > THICKNESS OF Ca

FIG. 189

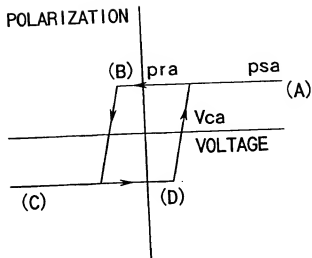


FIG. 190A

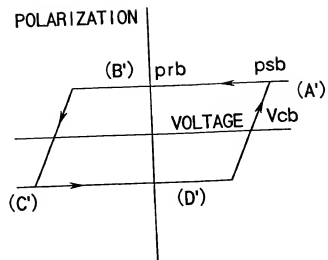


FIG. 190B

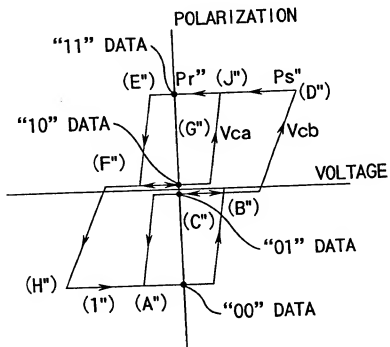


FIG. 190C

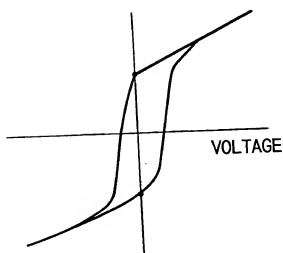


FIG. 191A

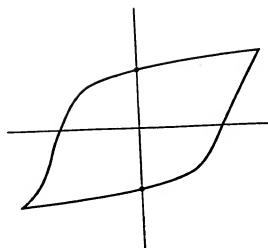


FIG. 191B

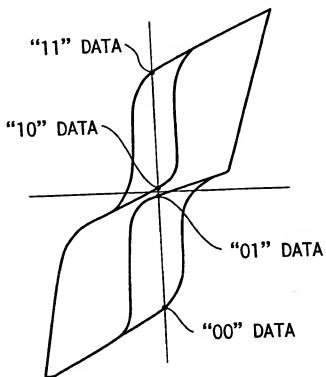


FIG. 191C

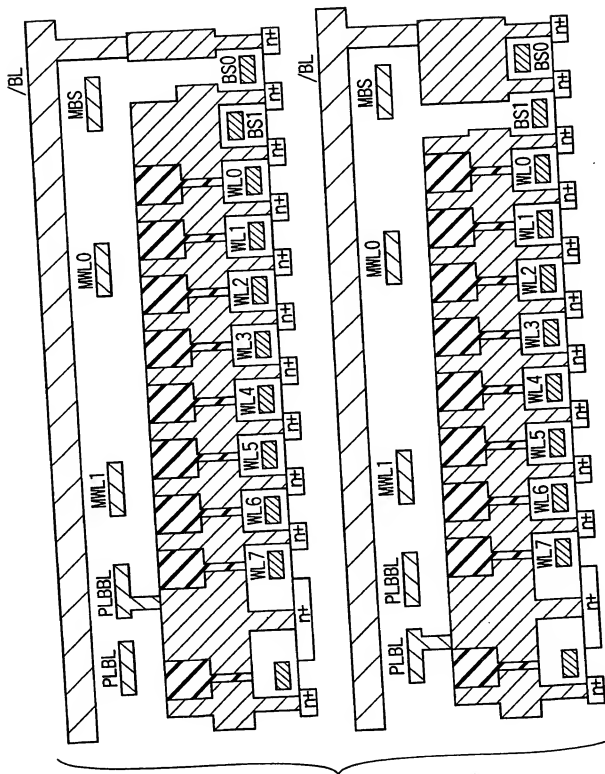


FIG. 192



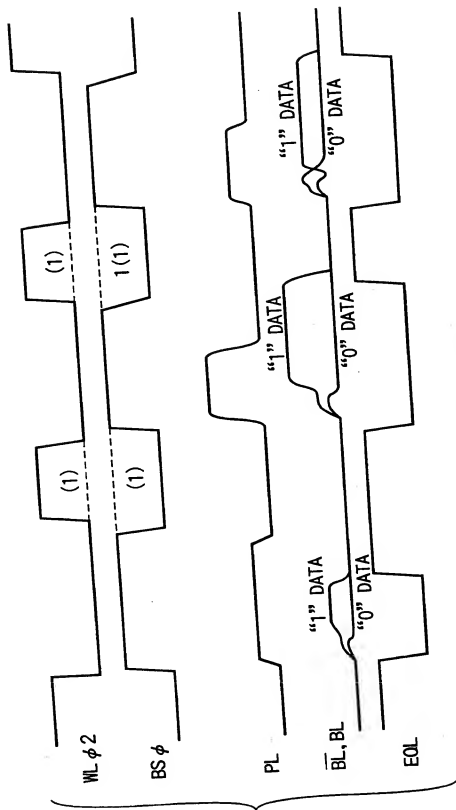


FIG. 193

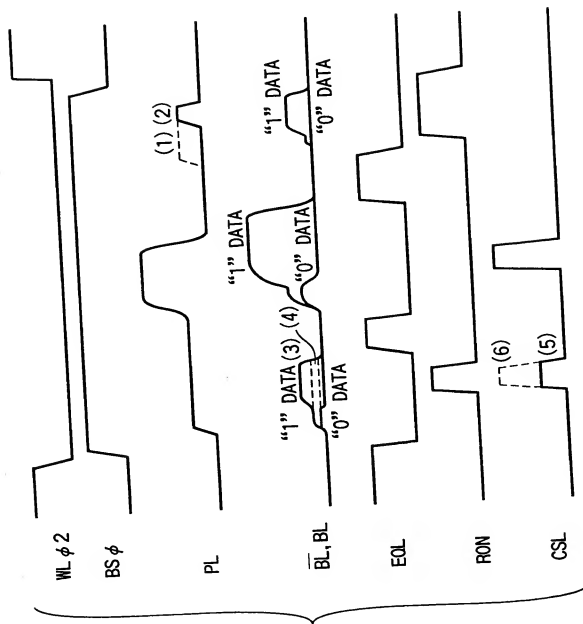


FIG. 194



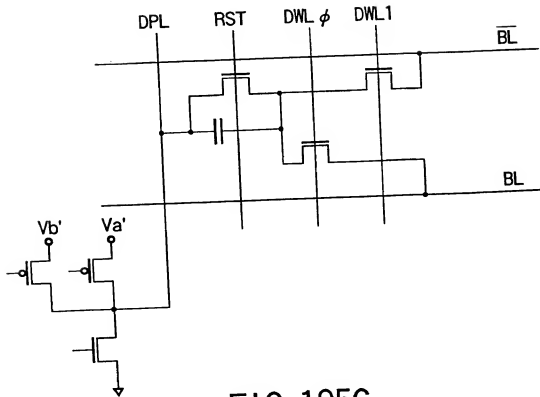


FIG. 195C

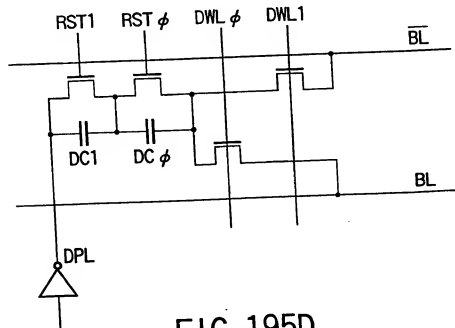


FIG. 195D

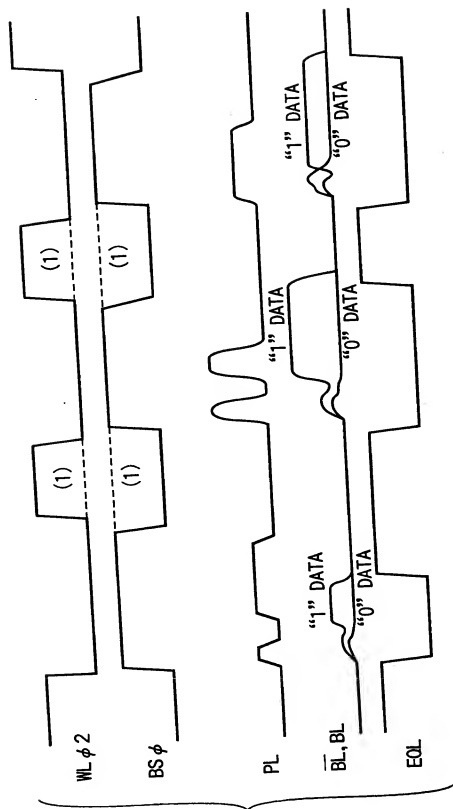


FIG. 196

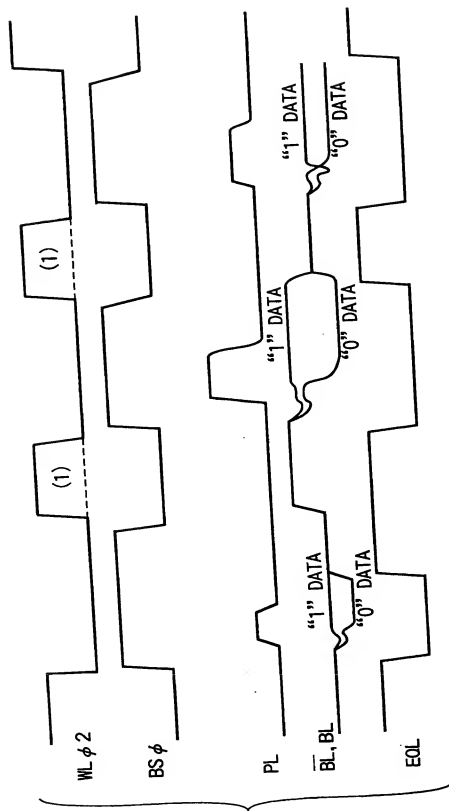


FIG. 197

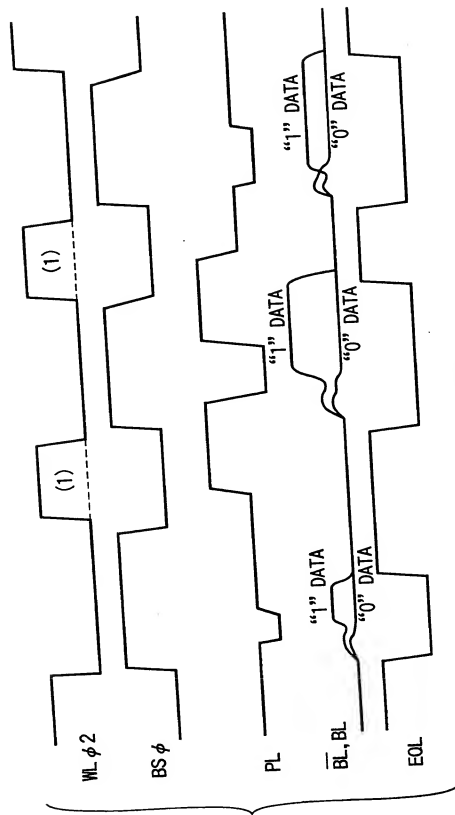


FIG. 198

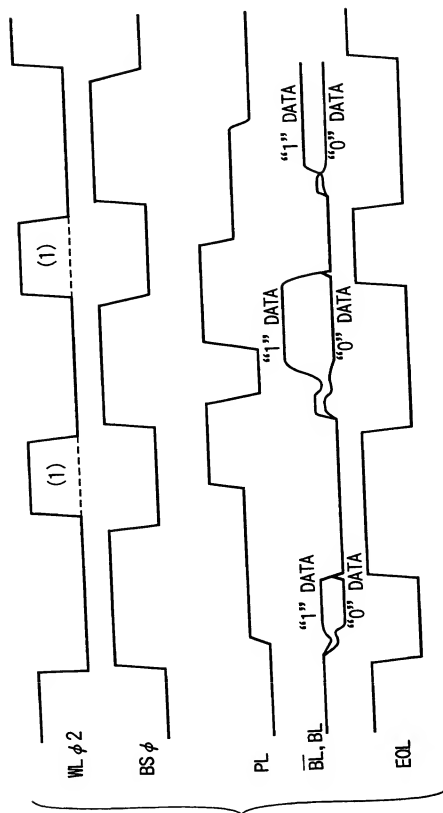


FIG. 199



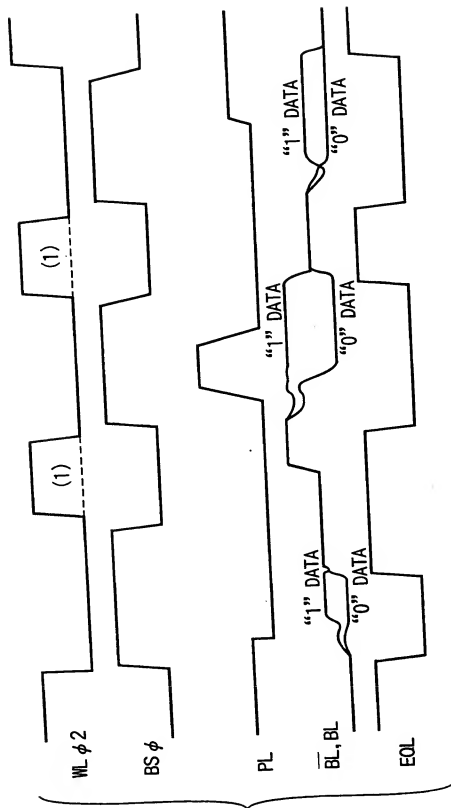
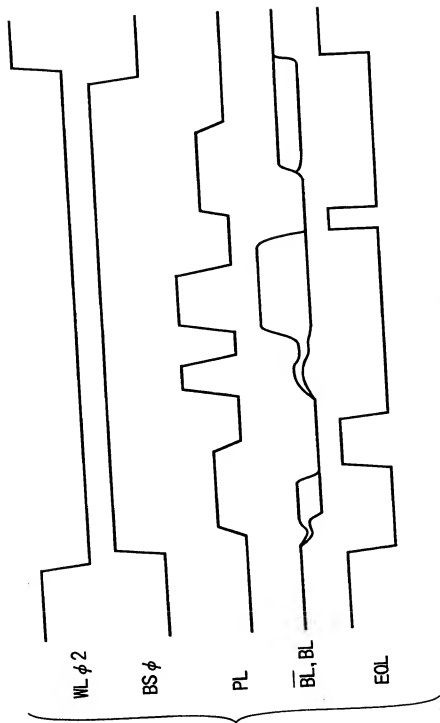
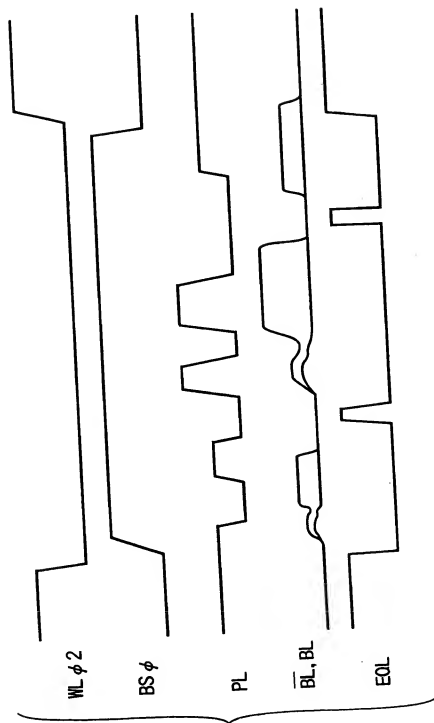


FIG. 200





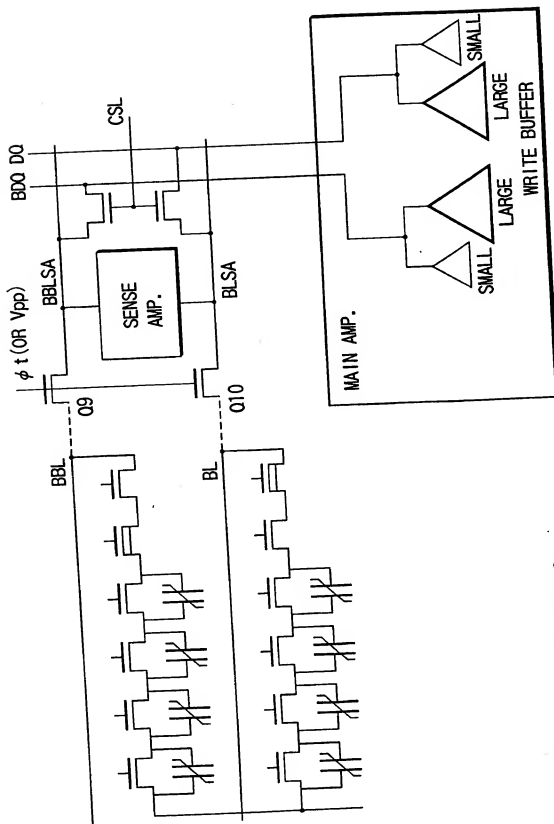


FIG. 203

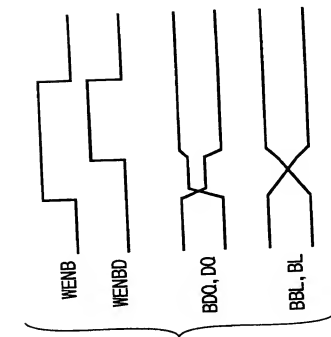


FIG. 204C

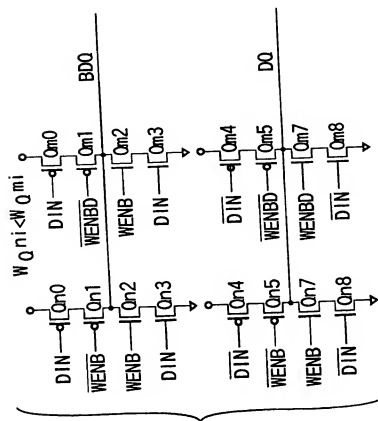


FIG. 204A

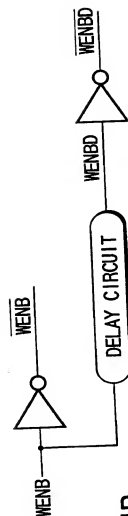


FIG. 204B

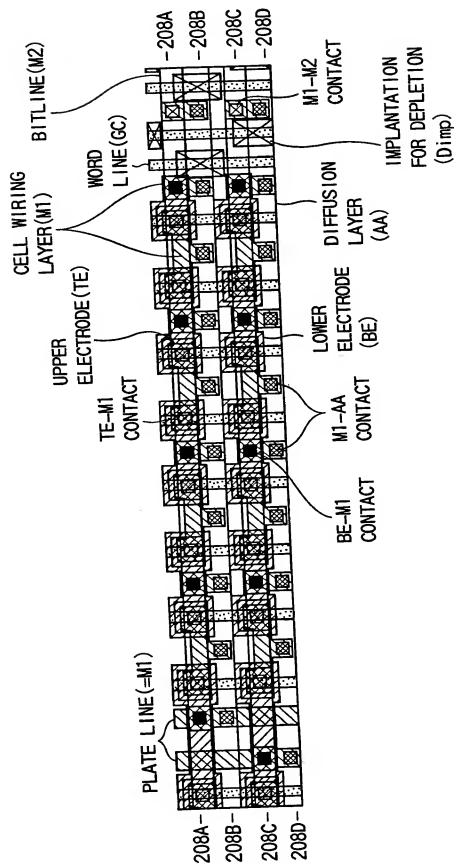


FIG. 205

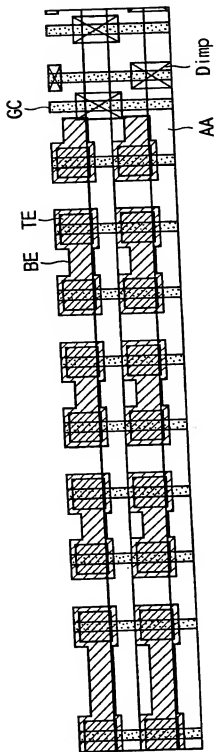


FIG. 206

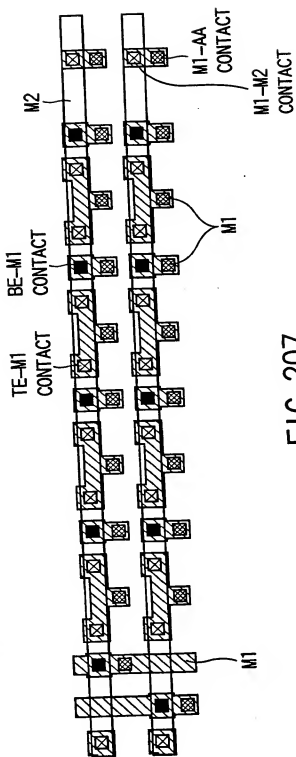


FIG. 207

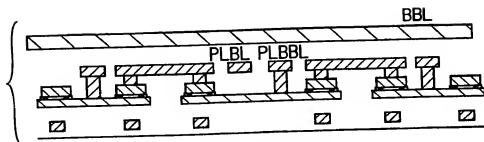


FIG. 208A

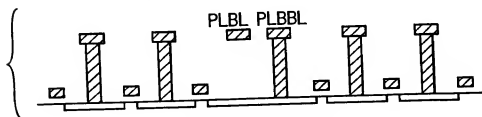


FIG. 208B

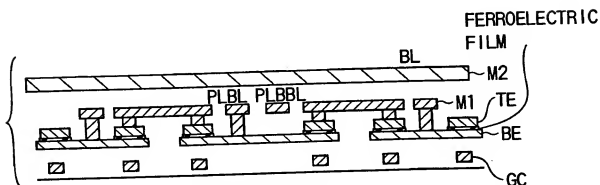


FIG. 208C

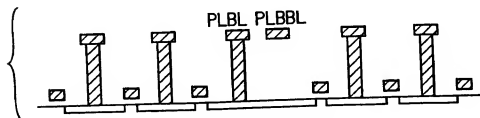
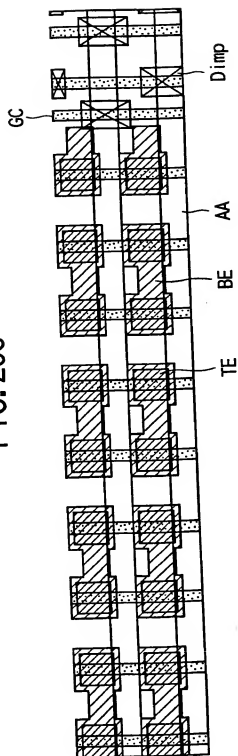
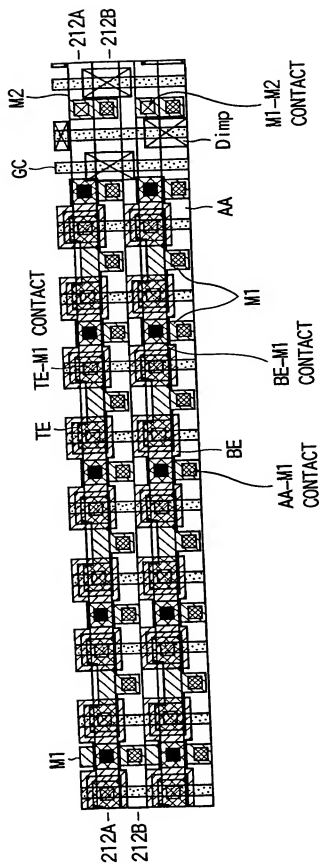


FIG. 208D





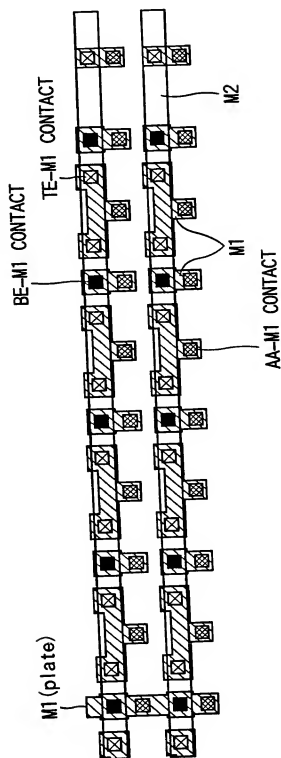
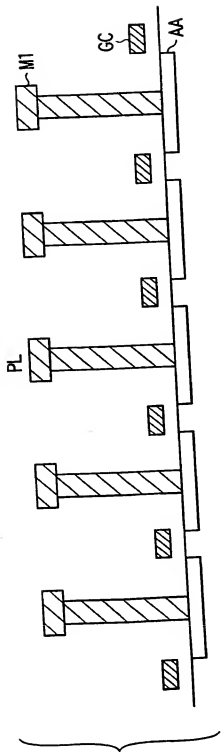
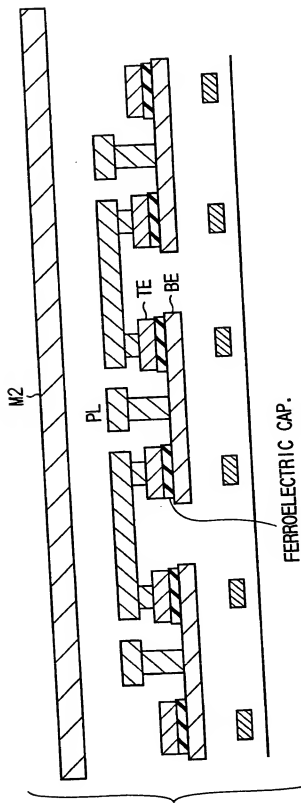


FIG. 211



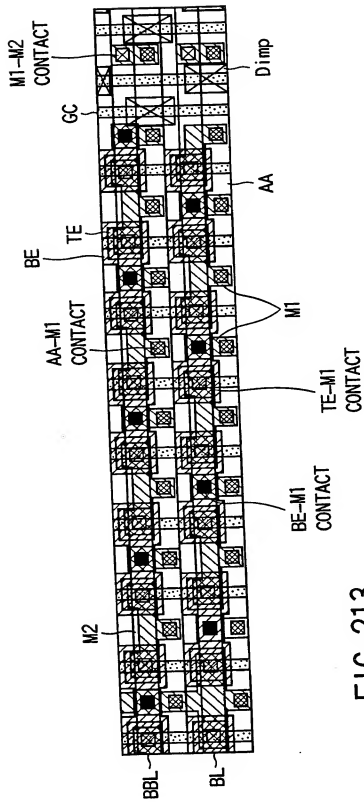


FIG. 213

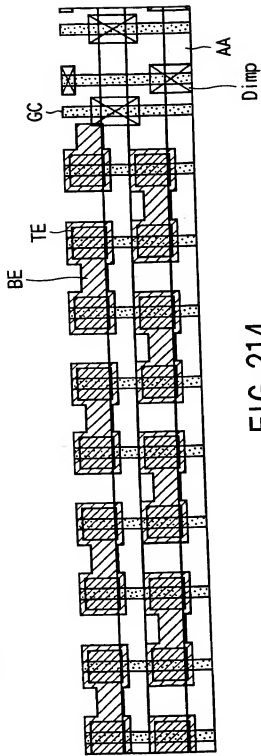


FIG. 214

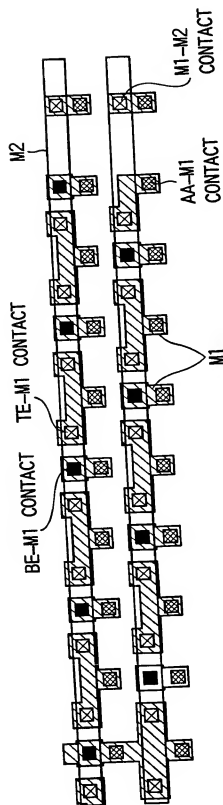


FIG. 215

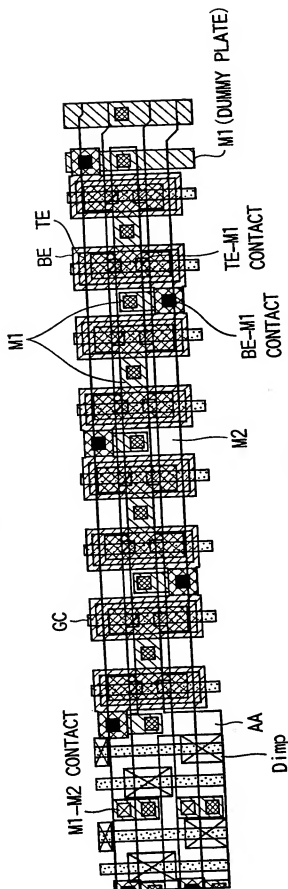
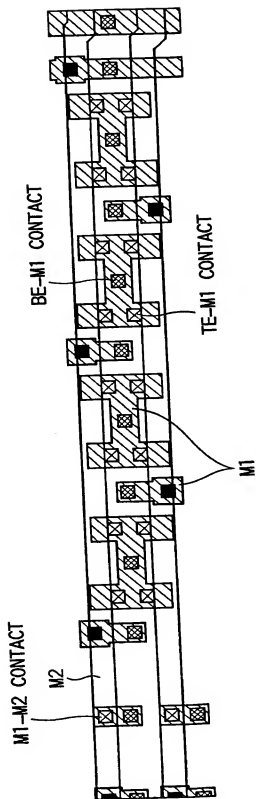
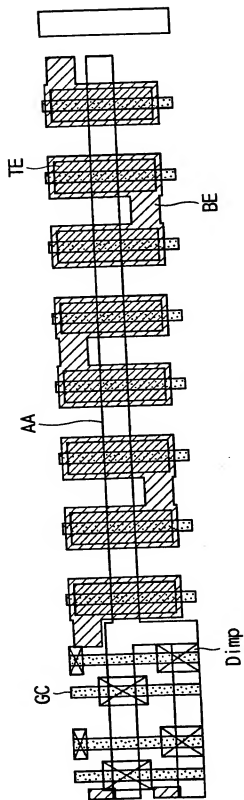


FIG. 216



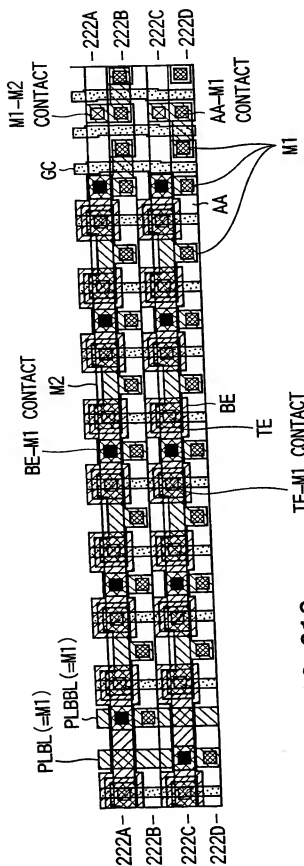


FIG. 219

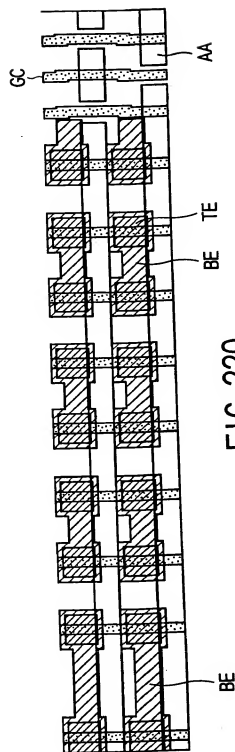


FIG. 220





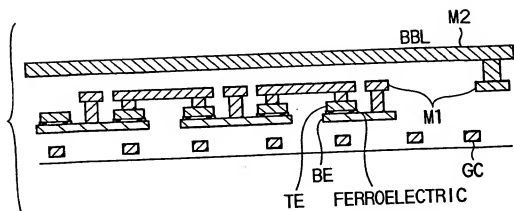


FIG. 222A

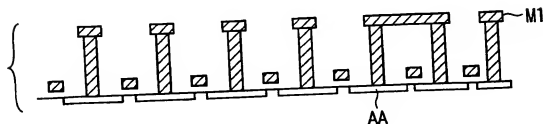


FIG. 222B

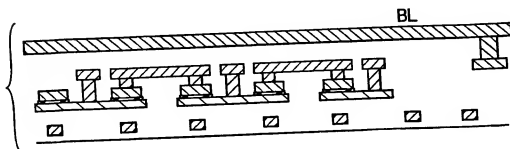


FIG. 222C

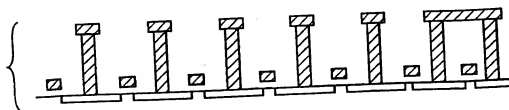


FIG. 222D

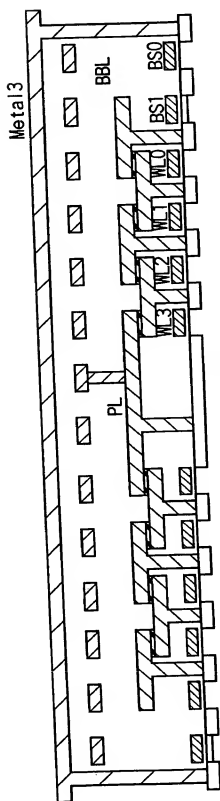


FIG. 223A

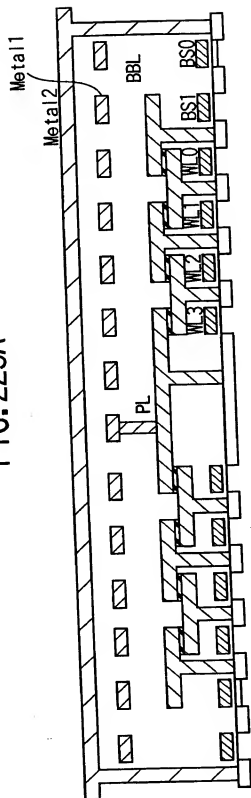


FIG. 223B

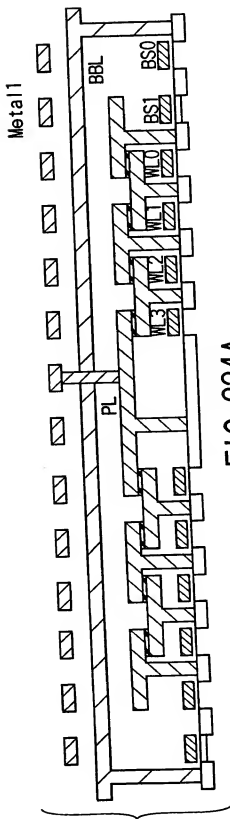


FIG. 224A

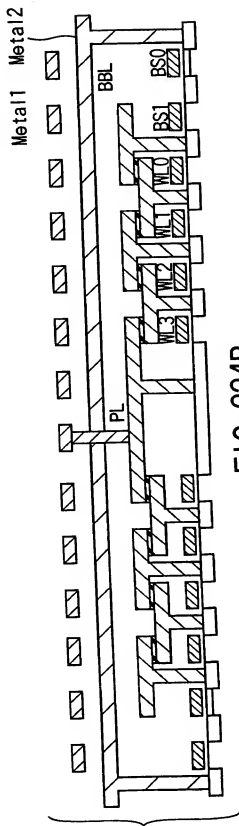


FIG. 224B

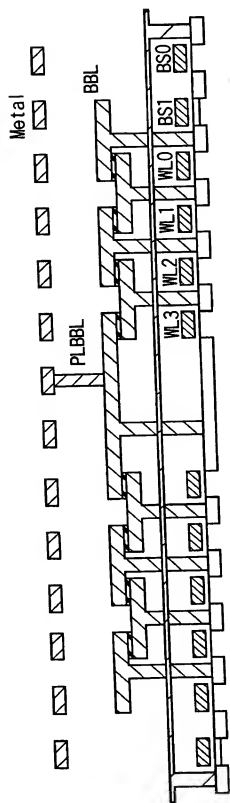


FIG. 225A

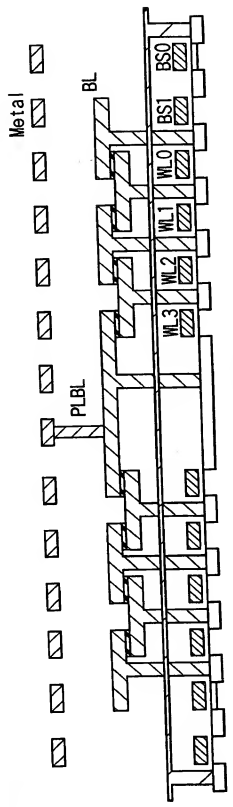


FIG. 225B

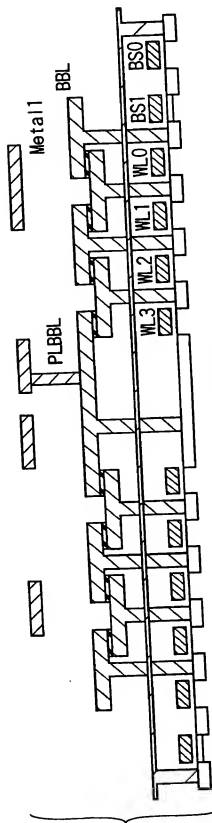


FIG. 226A

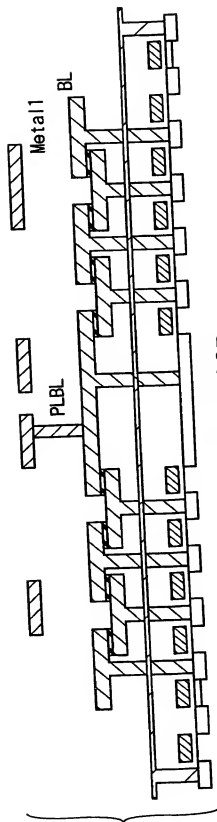
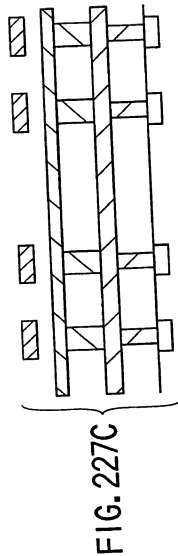
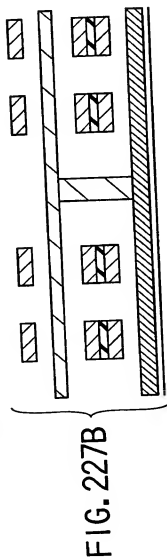
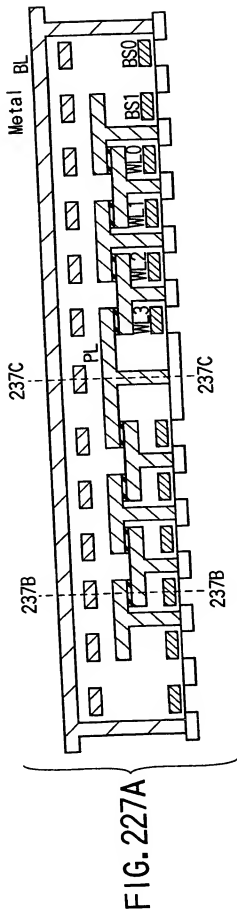
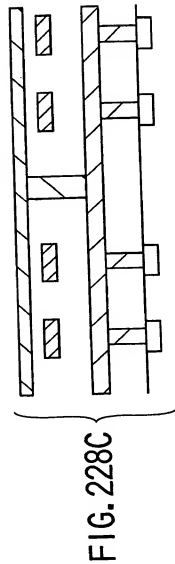
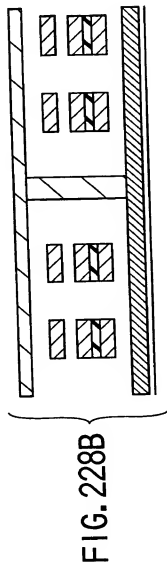
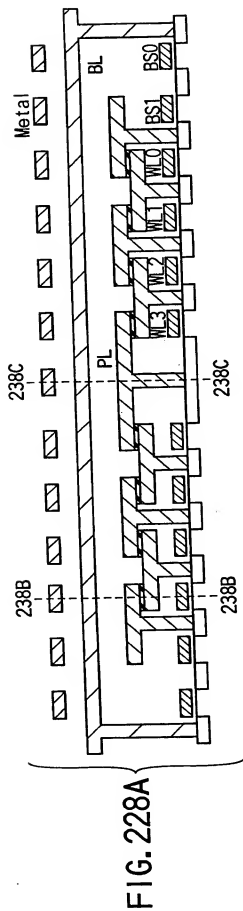
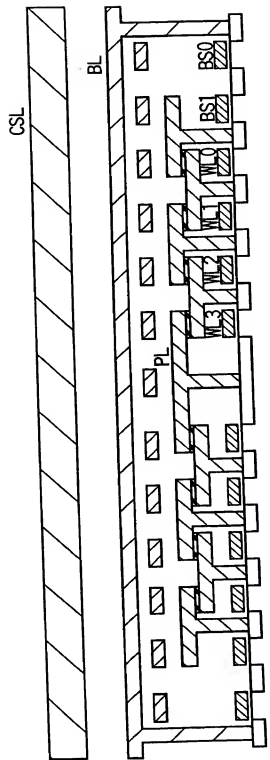
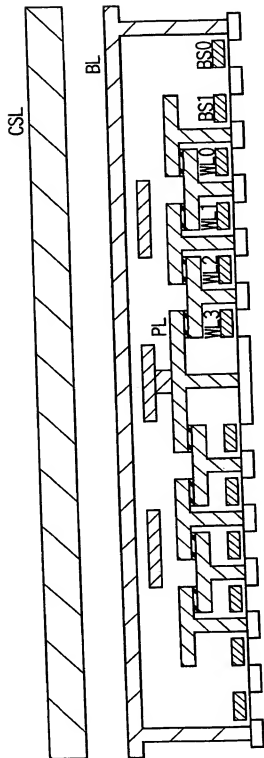


FIG. 226B









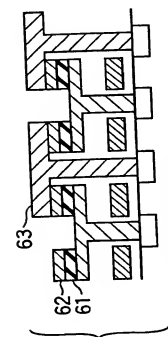


FIG. 231A

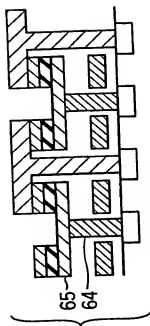


FIG. 231B

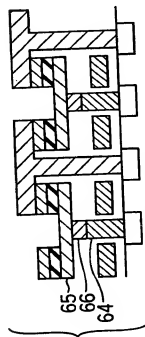


FIG. 231C

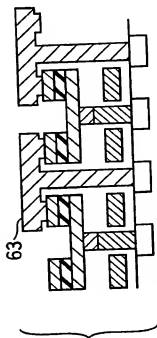


FIG. 231D

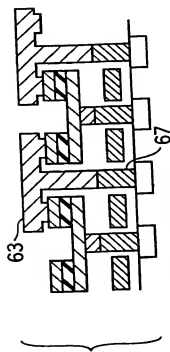


FIG. 231E

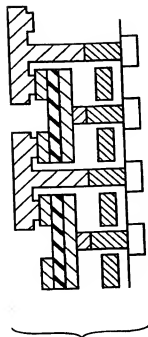


FIG. 231F

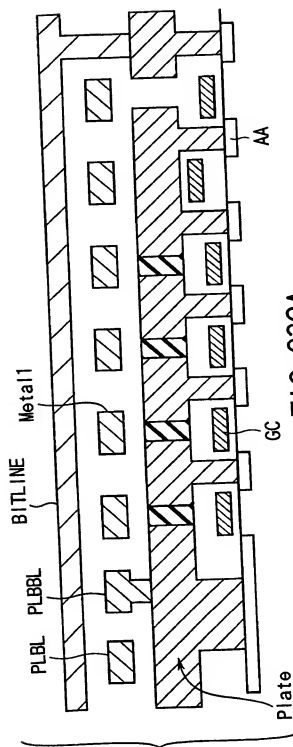


FIG. 232A

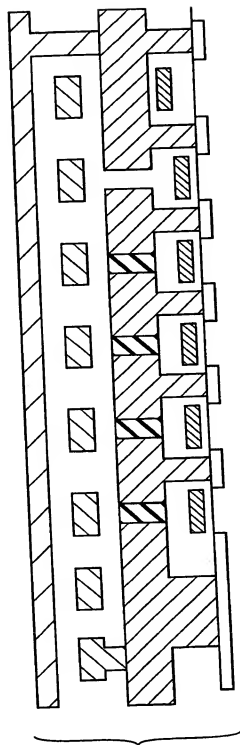


FIG. 232B

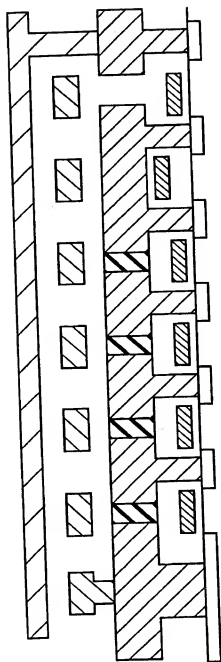


FIG. 232C

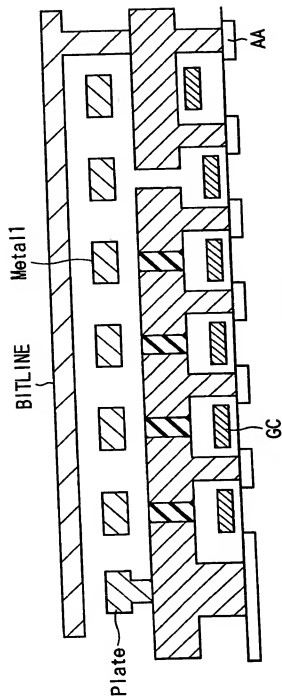


FIG. 232D

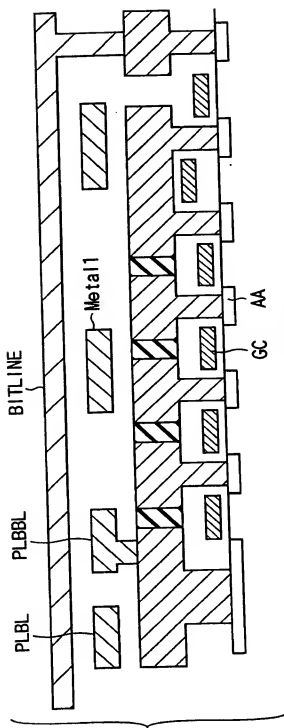


FIG. 232E

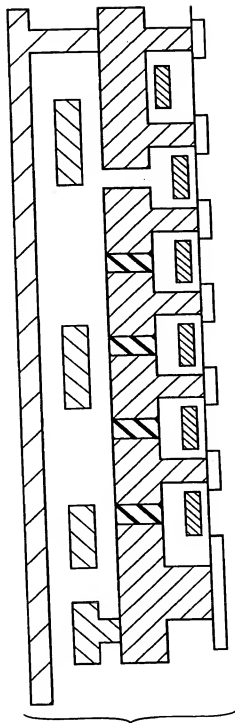


FIG. 232F

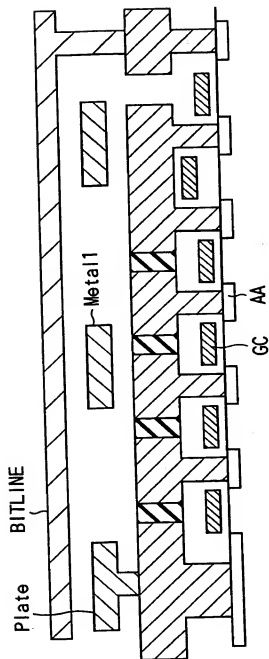


FIG. 232G

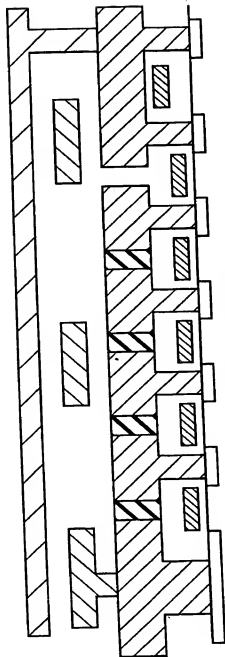
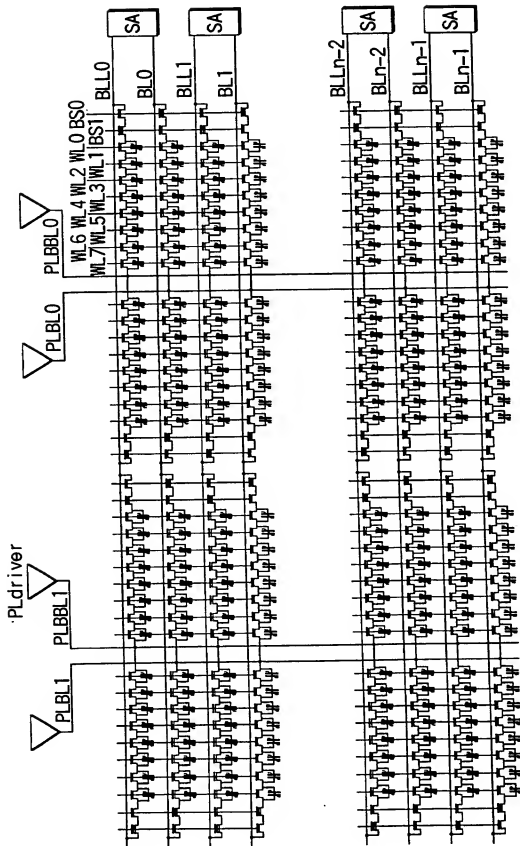


FIG. 232H



**FIG. 233**

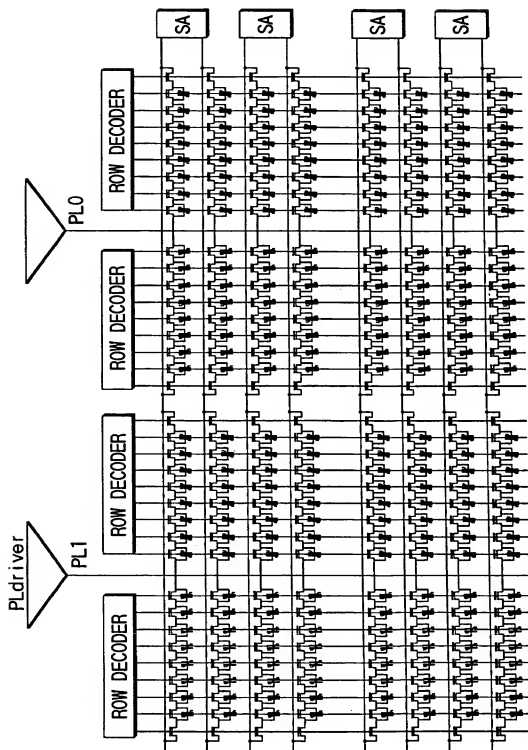


FIG. 234

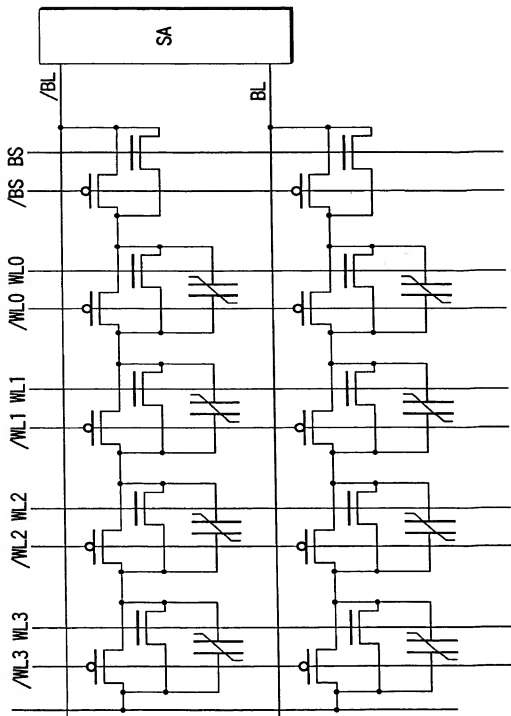


FIG. 235



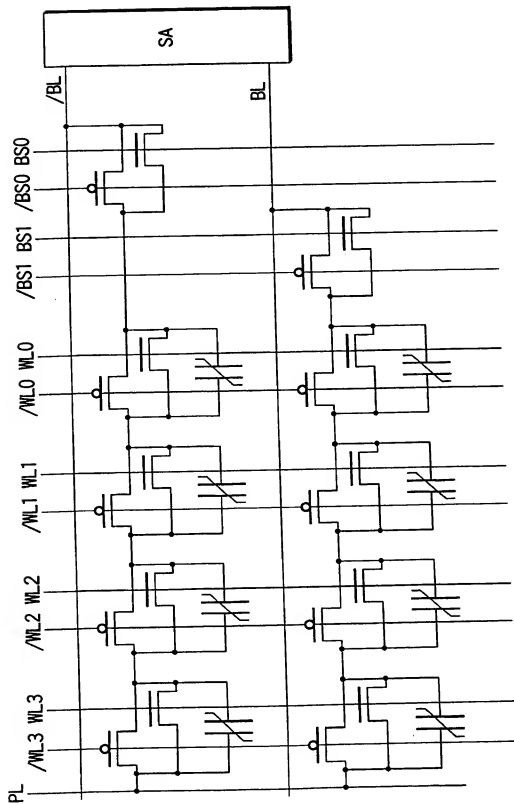


FIG. 236

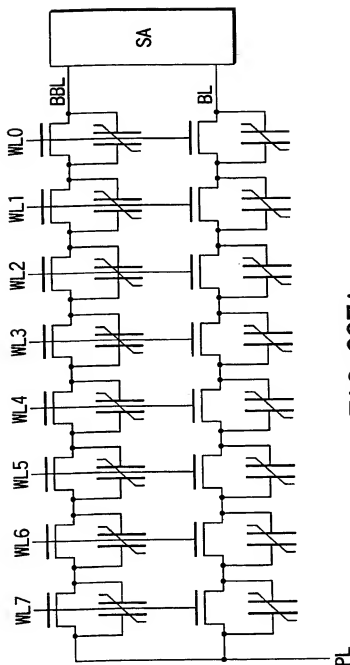


FIG. 237A

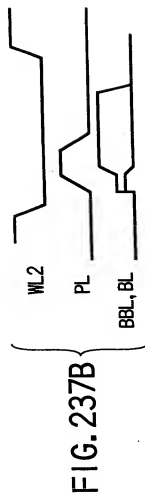


FIG. 237B